ISSN 2384-9398

GeoProgress Journal

Volume 3, Issue 1, 2016

“Food, geography and security policies”

GEOPROGRESS EDITIONS

NOVARA

Geoprogress Association

at University of Eastern Piedmont
Via Perrone 18 - 28100 Novara, Italy

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ISSN **2384-9398**

GeoProgress Journal

Volume 3, Issue 1, 2016

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NOVARA

GeoProgress Journal

Is a serial publication of scientific papers edited by Geoprogress in line with its strategic objective to increase and disseminate knowledge in order to contribute to the progress of humanity.

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Table of contents

Editorial Note

Last year, 2015, the year of the EXPO of Milan, this Journal has treated the theme of food, in many respects and in its interactions with the environment, natural and social.

"Feeding the Planet", although it is an absolute political priority and as such it has been assumed in the Milan Charter, seems to have been however essentially a slogan, and there risk that such remains if to that fundamental issue does not pay greater attention the scientific community and, more general, social and political.

For this purpose, and particularly in order to shift the focus from the delights and excellent foods (enhanced by the Expo) to issues of world hunger and how to ensure food security for everyone - anywhere in the world and without compromising the ecological conditions of life and "production - this journal chose to discuss on "food geography and food security policies" when, in 2016, promoted the first edition of the Geoprogress Global Forum (GGF).

This issue of journal publishes part of the papers proposed by researchers at the international conference organized within the GGF 2016 and, in the section for "Documents", some contributions of institutions and associations invited and of other participants.

Deserves to emphasize among these contributions, in my opinion, the writing presented by the IFAD representative, Adolfo Brizzi, not only because it highlights the vision of the problem of hunger, which is proper to of the United Nations system, and proposed policies internationally, but also it is consistent with the interpretation from the main studies and experiences on underdevelopment, poverty, hunger and environmental degradation. Culturally and politically very interesting is also the intervention sent by Brando Benifei of the European Parliament, not only because it expresses the will of a large political group, but also the position and hope of most Europeans who see in a Europe more united and determined politically the prospect of a positive solution of the major contradictions of the contemporary world.

Emer. Prof. Francesco Adamo, Editor in Chief

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.

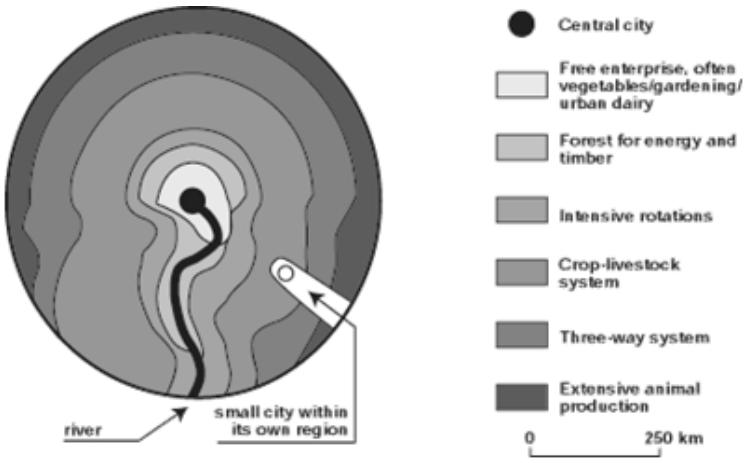

Figure 1: von Thünen's model showing distortions if the area is not homogeneous

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.

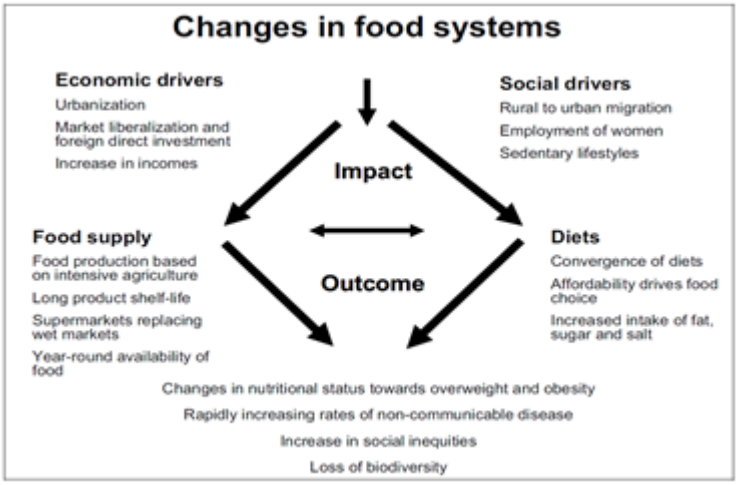

Figure 2: Changes in Food Systems

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.

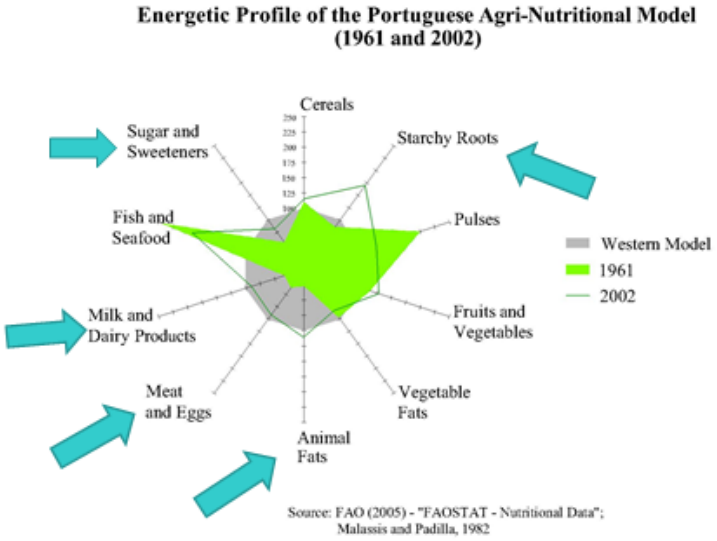

Figure 3: Energetic Profile of the Portuguese Agri-Nutritional Model

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).

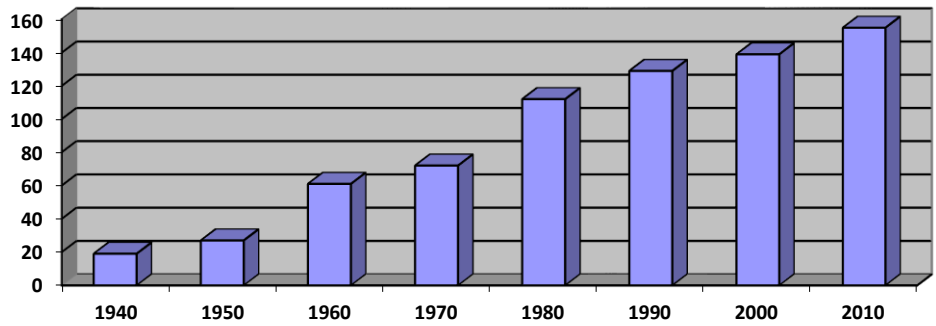

Figure 6: Number of People fed by one American Farmer (1940 – 2010)

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.

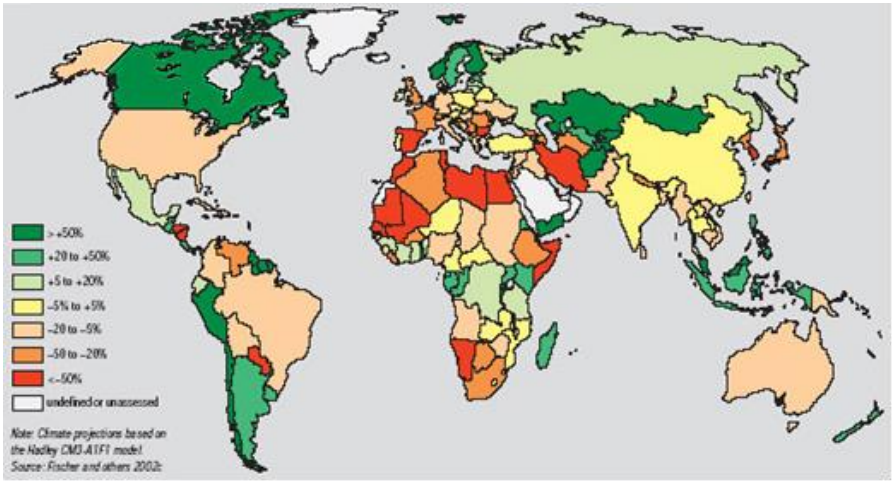

Figure 7: Projected percentage gain and losses in rainfed cereal production potential by 2080
Source: UNEP (2006, 30)

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.

INDEX-BASED INSURANCE CHALLENGES AND SOCIO-ECONOMIC CONSIDERATIONS. THE IBLI-KENYA CASE

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Abstract

This paper summarises experiences of index-based weather insurance initiatives in Kenya, and drafts preliminary conclusions about lessons learnt as well as some recommendations for decision makers and implementers. In particular, we highlight some key issues related to index insurance products in order to gain insights into the effectiveness of this instrument. We describe specific examples of pilot programmes, identify the main challenges, and suggest possible improvements to the economic sustainability of the index insurance market. We also describe technical developments, commercial challenges and sale performance, mainly linked to the Index-Based Livestock Insurance (IBLI) project. We have seen that neither the provision of discount coupons nor the number of assets insured approach a level of commercial viability. We conclude that the low uptake and increasing disaffection of those that tested the product brings us to rethink the role of index insurance as a product to protect farmers/pastoralists, and particularly to improve their food security.

1. Introduction

Index insurance is a well-established tool, but has only recently been introduced in developing countries to reduce the impact of adverse weather-related events (Skees, 2008)[1]. Index insurance is one of several risk management mechanisms. Primarily used in the agricultural sector, this instrument basically covers agricultural risks deriving mostly from weather-related perils such as droughts, floods, frosts and storms.

There are currently two types of index products: Area yield index insurance and Weather Index Insurance (WII). With Area yield index insurance, the indemnity is based on the average yield of an area (such as a county or district), rather than the actual yield of the insured party. The insured yield is established as a percentage of the average yield of the area. An indemnity is paid if the insured yield is less than the average yield of the area, regardless of the actual yield of the policyholder. This type of index insurance requires historical yield data for the area being insured.

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[1] "Multiple peril crop insurance began in the late 1930s. The program exhibited only slow growth, and by 1994 less than 100 million acres were enrolled. With successive reform acts, passed in 1994 and 2000, the increased premium subsidy levels, particularly at higher levels of coverage, led to a higher uptake (by 2011 over 265 million acres were enrolled in the program). Japan implemented a multiple peril crop insurance program in 1939, subsidizing 15% of premium costs. Canada passed legislation authorizing multiple peril crop insurance in 1959, and after World War II multiple peril crop insurance programs were gradually introduced with subsidized programs in Austria in 1955, Italy in 1970, Spain in 1980, and France in 2005." Smith and Glauber (2012)

WII is based on observable parameters (such as rainfall anomalies) as a proxy for crop loss. Ideally, the index is readily available, objective, transparent, independently verifiable, reportable in a timely manner, and sustainable over time (World Bank, 2005). In this case an indemnity is paid whenever the value of the index exceeds a predefined threshold (for example, when protecting against excessive rainfall) or when the index is less than the threshold (for example, when protecting against a rainfall deficit). More sophisticated forms of index insurance use satellite imagery to determine potential losses of crops or livestock forage (used as a proxy to predict livestock mortality).

Unlike traditional insurance, index insurance is expected to respond to objective parameters that farmers or insurers cannot influence[2] (Miranda and Farrin, 2012). This removes much of the inefficiency of conventional insurance (i.e. moral hazard and adverse selection are removed, administrative costs are low, and payments are made in due time; Mirnada and Farrin, 2012), while eliminating some administrative costs, such as those associated with on-farm loss assessment.

Beyond the many advantages usually associated with this product as compared to conventional insurance mechanisms, index insurance products are intrinsically imperfect mainly because they rely on estimations and calculations that might contain errors. This error, which translates into the incapacity of an index to detect losses and trigger payouts, is called basis risk, which mainly consists of a mismatch between the value of the weather parameter identified by the index and the actual losses. Basis risk is bi-directional, since the error can affect both the insurer and insured – the index can trigger a payment where there hasn't been any loss, or can fail to trigger an indemnity when the insured faced a loss.

In this context, "the effectiveness of index insurance, as a risk management tool, depends on how strongly farm yield losses are correlated with the underlying index. In general, the more homogeneous the area, the lower the basis risk and the more effective area-yield insurance will be as a farm-level risk management tool. Similarly, the more closely a given weather index actually represents weather events on the farm, the more effective the index will be as a farm-level risk management tool" (World Bank, 2005).

To overcome some of the issues linked to limited and poor information sources for index design, the insurance market has seen a steady increase in recent years in the use of remote sensing, which is seen as a potential alternative to other forms of information (Leeuw et al., 2014). Nevertheless, although remote sensing can complement the technical improvement of the indexes, it has limited applicability to the insurance industry. A number of technical factors that constrain the use of remote sensing in index design will be discussed in section two, together with other socio-economic factors that have to date hampered the uptake of index insurance.

The remaining parts of the paper are structured as follows: section three provides a detailed discussion of the development of a particular form of index-based insurance in Kenya: Index-Based Livestock Insurance (IBLI); section four focuses on discussing the

[2] However, though the parameter itself cannot be arbitrary influenced, the insurer have the advance of owing a set of information that they can still manage to their own benefit. Indeed, insurance companies have the possibility of setting the thresholds at which payouts for a given peril are triggered at a slightly lower level than the one that would make them to pay a number of predefined times.

opportunity of exploring alternative approaches; and some conclusions and recommendations are drawn in section five.

2. Challenges related to index-based insurance

Despite the potential advantages of index insurance, uptake has not met expectations. Johnson (2013) reports that targeted clients have often not purchased insurance coverage to the extent expected by development agencies, economists and insurance companies. The low uptake raises a number of questions not only linked to the understanding of the limiting factors of product uptake, but also with regard to the need for government intervention in the form of relief programmes for the uninsured where insurance coverage is low (Binswanger-Mkhize, 2012).

There are several possible explanations for low uptake, the most common being lack of product awareness (IFAD, 2010), limited premium affordability (Carter, 2012; Burke et al., 2010), lack of familiarity with or trust in the external agent and cultural acceptance (BFA, 2013; Cole et al., 2013, Dercon et al., 2011; Patt et al., 2009), insufficient financial literacy (Cole et al., 2009; Giné and Yang, 2009), cognitive failure (Skees, 2008), rising of risk and ambiguity aversion mixed with basis risk (Clarke, 2016; Bryan 2010); low willingness to pay for insurance products (Chantarat et al., 2009) and time inconsistencies (Duflo et al., 2010). In the following sub-section we try to group and discuss the most challenging points into three broad areas: efficiency, affordability and scalability.

2.1 *Efficiency*

Product efficiency in terms of index-based insurance can be referred to as the capacity of an index to capture the loss of the insured. The underlying assumption at the basis of an efficient product is that the index, on which the payout is established, is highly correlated with what is insured (i.e. livestock or crop), and that the risk is spatially correlated (as is typical in the case of drought). The first hypothesis implies that the parameters used in the construction of a weather index should not only reproduce the condition of the weather variable(s), but should also be "correlated with yield or revenue outcomes for farms across a large geographic area" (Manuamorn, 2007). This aspect relates to the second assumption, which suggests that in order for an index to work efficiently, the risk should occur across a vast area. This is "because it is the covariate nature of a hazard that allows the insurer to predict losses and determine indemnity payments for a large number of policyholders over a wide geographical area" (de Leeuw et al., 2014).

Thus, for index insurance to provide effective protection to crops and productive assets, a basic requirement is that the chosen weather parameters need to be measurable, objective and representative of the predominant risk to the crop/livestock insured.

If, for instance, the purpose of an index is to insure an individual against drought (which might cause loss of yield or assets), we will need to find a variable that can measure the amount of rainfall in a certain period. Rainfall can be measured, and it is also an objective variable because in theory it does not depend on any individual actions. Nevertheless, de Leeuw et al. (2014) note that for weather-based index insurance that uses rain gauges, the condition of impartiality (intended here as

objectivity) is sometimes impractical in remote areas when farmers with an interest in insurance also maintain the rainfall stations.

However, meteorological variables are not the only types of information necessary to build an index. Indeed, whilst yield-based or cumulative rainfall indices simply require the use of actual and historical outcome records, indices that use proxies of weather variables (rainfall/temperature estimates such as satellite-measured vegetation indexes) also need information on the meteorological variable they represent. For example, in the case of index insurance that uses rainfall estimates (satellite sensors do not measure rainfall but a proxy - e.g. cloud-top temperature or microwave radiometry), the product designer will need:

- satellite-based rainfall estimates: usually available for more than 30 years[3] and in near-real time, with full spatial coverage of a region, and generally free of charge;
- ground-based meteorological variables: to establish a correlation between satellite estimates and measured rainfall (this correlation can be biased if the rain gauge or the automated station is not maintained); and
- the yield or revenue, to prove that the index correlates well with the performance of the insured product.

The same applies to other examples of remote sensing indices, such as the Normalized Difference Vegetation Index (NDVI). Thus, to have an index that correlates well with losses, the index (i.e. the underlining variable) should be calibrated with ground data. Graphical representation of the relationship between crop yields (or any other ground data) and rainfall estimates is often omitted from empirical research, which raises some doubts about the ability of these indices to capture the real losses of farmers, and thus to meet their needs.

In addition, the fact that the majority of pilot tests were carried out in areas close to weather stations[4] and where ground data was available raises concerns about the future scalability of the product in more remote areas. In general, it is assumed that index insurance represents a valid instrument in areas with dense station networks that are representative of the effective spatial rainfall. From an index prospective, the lack of a complete set of such information increases the risk of commercialising an index that cannot accurately determine losses. The idea of minimising basis risk by installing more weather stations has to be considered with caution, as investment might not yield the expected returns. Similarly, the adoption of satellite information as an alternative source of weather information should be limited to those areas where calibration with ground-based rainfall measurements is possible (de Leeuw, 2014). Thus, the use of satellite rainfall estimates cannot be considered as an independent alternative source for index-based insurance, but rather as a support to further improve their accuracy

Another aspect to consider is the representativeness of the predominant risk. Index insurance is considered to be a suitable and appropriate risk transfer mechanism in areas with homogeneous climatic conditions (Hess, 2007). This is because "basis risk will be

[3] Records of both ground- and satellite-based estimates have to be sufficiently long to be able to properly underwrite the risk and accurately price the insurance product.

[4] Washington et al. (2006) estimated that the African network "has an average station density of only one per 26,000 km^2, which is 8 times lower than the WMO minimum recommended level

high in areas with microclimates where the weather risk is not correlated" (Carter, 2014). Thus, the high relevance of idiosyncratic risk could offset the benefit of any product designed for highly correlated risk.

An attempt to improve the exploitation of index-based insurance in areas with low weather station density was made by Gommes and Göbel (2012). They concluded that real-world insurance cannot function without at least some form of spatial interpolation, and that indices based on rainfall interpolation and/or crop growth modelling simulate yields more accurately than the standard methods that are based on station rainfall data only.

2.2 *Affordability*

High premium prices have been identified as the main constraint faced by farmers when purchasing insurance. That is why product expansion has mainly been driven by subsidies and the support of donors. Sina (2012) states that "the cost for index-based insurance is often considered high by low-income farmers as incomes of the vast majority in developing countries are absorbed by basic necessities such as food and housing", implying that low uptake by smallholders might be mainly due to a lack of economic means.

Sensitivity to price increases has been proven by different authors. Cole et al. (2013), show how a 10% decline in the price of insurance increases the probability of purchase by 10.4%. Similarly, McIntosh et al. (2013) show that demand for the rainfall index insurance offered was very price elastic and highly correlated with the amount of coupons distributed. While in Kenya, although the reduced price of the insurance through the provision of discount coupons significantly increases the uptake of IBLI (Takahashi et al., 2014), the overall uptake level across the four sale windows remains disappointing (ranging from 26% of the first sale in August-September 2012 to 12% of the last sale in January-February 2014).

However, the idea that lack of economic means hampers scalability is contrasted by the fact that, although the insured receive premium subsidies[5], the overall purchase rate remains very low (see section 3.1), which would probably prevent private insurers from entering the market.

A related concern refers to the willingness of donors (the main suppliers of funds) and governments to continue to financially support subsidies. Should this support end, due to lack of resources or unwillingness to continue, the market would probably collapse. In addition, it has to be considered that the allocation of subsidies requires a careful examination of other investment options that might provide comparable social benefits (Fuchs et al., 2011) and a higher long-term impact on development and growth (such as irrigation facilities, roads or other infrastructure). Furthermore, although subsidies can lead to an increased level of uptake, they could have an anchoring effect (i.e. relying too heavily on the first piece of information offered to make subsequent judgments). However, it is preferable to use a smart subsidy[6] (where beneficiaries pay a

[5] In some cases, premium subsidies are considered to distort the market, because they crowd out alternative risk transfer or risk mitigation strategies (GlobalAgRisk, 2011).

[6] "Smart" subsidies are designed and implemented in ways that provide maximum social benefits while minimising distortions in the market and the mistargeting of clients. A subsidy should have a clearly stated and well-documented purpose. It should address a market failure or equity concern, and

fair price, referred to as the sum of pure prime plus the premium loading - the amount an insurer needs in order to cover its expenses and generate profit).

2.3 *Scalability*

For the reasons discussed above, scaling up to the commercial level implies massive investment in both infrastructure and delivery channels. Such investments can be put in place only if the product becomes profitable for the insurers. Companies will thus consider the size of potential clients, affinity with distribution partners, and cost effective means of distribution. So far, uncertainty about the scalability of the product, confirmed by the low uptake of different pilots, led private companies to hold back on investing time and resources in building internal capacity and in funding "new experiments". However, in some cases this is also the result of little concrete and long-term business thinking in relation to the products, which may have been exacerbated by a lack of technical expertise (Bankable Frontier Associates-BFA, 2013). In other cases, sales were limited by the inappropriateness of the product[7] and misleading behaviour of sales agents that led to misunderstandings about the product features (Bankable Frontier Associates-BFA, 2013). Overall, the scalability of index insurance products remains uncertain.

Probably, in order to reduce the risk of offering an imperfect product, targeted analyses should be carried out to identify primary risk and to simultaneously compare the costs and benefits associated with product scalability before undertaking further experiments. Furthermore, being the use of satellite estimates considered the most suitable alternative to scares and incomplete data deriving from rain gauge network, it would probably be worth to further investigate the magnitude of the error (basis risk) associated to an index. This type of study, currently lacking, would provide a clear explanation of the capacity of this product to function as a protection toll for vulnerable farmers and pastoral.

In the long term, the increasing number of pilot projects carried out with imperfect products, limited distribution channels and emergent marketing skills can lead to incorrect perceptions by customers about a product, and destroy the trust of potential consumers. In developing and piloting insurance products, customer perception and trust deserve high priority.

3. Index based insurance in Kenya

Index insurance was first introduced in Kenya in 2005, and the Financial Sector Deepening of Kenya (FSD) has been involved since the beginning. The evolution of WII in the country has been covered in a number of reports and academic articles by the

should successfully target those in need with minimum inefficiency. Smart subsidies are designed with a clear exit strategy or with a long-term financing strategy in mind. Additionally, a good monitoring and evaluation system that tracks the performance of subsidies is paramount for the success of any subsidised insurance scheme.

[7] For instance in the case EPIICA, a four-year research project carried out in Ethiopia (McIntosh et al., 2013), sales fell in West Gojam because the primary risk faced by farmers was hailstorms and excessive rainfall rather than drought, whilst in some localities of North Wollo the index did not trigger the payouts, leading farmers to question the reliability of the product.

World Bank (2011), IFAD (2010), and Clarke (2012). A number of different forms of index insurance have been piloted in Kenya in recent years[8].

Most of the pilots carried out in Kenya were undertaken with the technical guidance of the World Bank. Others are independently led by the Syngenta Foundation for Sustainable Agriculture (now the Agriculture and Climate Risk Enterprise - ACRE), the International Livestock Research Institute (ILRI) and, more recently, Planet Guaranty (together with other donors) and GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit). In general, a general lack of innovation (in terms of long-term business perspectives) and the focus of different pilots on a short-term horizon have contributed to hindering the assessment or prediction of future viability and sustainability of the various initiatives.

Whilst the majority of pilots carried out in the country all suffer from common limiting factors (i.e. imperfections in the construction of the index ,product awareness, financial literacy (Awel, 2015) and premium affordability (Burke et al., 2010)) in the next sub-section we will focus on those aspects that so far prevent the upscaling of one particular project, the Index-Based Livestock Insurance (IBLI).

3.1 *IBLI: product design and commercial challenges*

The Index-Based Livestock Insurance (IBLI) project was developed to cover livestock mortality related to forage scarcity due to drought, and was originally tested in 2010 in the Marsabit district. The product is designed to indemnify pastoralists in the event that their animals die because of drought. Under the IBLI, the pastoralists cover 15% of the herd loss, and any losses above 15% are compensated by the insurance company signing the product (Ngare et al., 2015). That is, indemnity payouts are triggered if the predicted livestock mortality index exceeds a threshold of 15%. A double threshold (10% and 15%) was introduced for the sales period August-September 2013.

As reliable rainfall information was not available, the index was developed by using the Normalized Difference Vegetation Index (NDVI) as a proxy of forage scarcity. The original index, designed for the Marsabit district, predicted livestock mortality rates using 20 years of historic data of livestock mortality and satellite measures of NDVI to generate an area-specific response function to map NDVI to average mortality rates (Chantarat et al., 2013). As Turvey and McLaurin (2012) suggest, area-specific ground data (in this case mortality data) are essential in order to meet one of the core assumptions for an NDVI to work as an insurance index. This condition was met in some areas of northern Kenya (and southern Ethiopia), where data on mortality are provided by the ALRMP database[9]. With regard to the performance of the index, Jensen et al. (2014) studied the correlation between the index (in its first version of Chantarat et al., 2012, applied to four divisions) and the full out-of-sample mortality data. The index was found to perform poorly in estimating drought-related mortality[10]. Consequently,

[8] In 2011 over 34 index-based weather insurance contracts were counted as having been developed (BFA, 2013).

[9] In other regions and in the absence of local mortality data, the model can be extended if agro-climatic conditions are very similar. But this would still require local fine tuning

[10] After that, three major improvements were adopted:

(1) The use of eMODIS NDVI at 250-m resolution instead of the NOAA-AVHRR NDVI at 8 km;

the algorithm described in Woodard et al. (2014) was applied from 2013, and the area covered extended to other counties[11]. Hence, starting from 2013, "the IBLI Marsabit index no longer explicitly predicted livestock mortality rates. Similar to the IBLI-Ethiopia product launched in August 2012 and other IBLI products in Kenya, the IBLI Marsabit product now makes indemnity payments according to an index developed using only NDVI values" (Mills et al., 2015).

Challenges associated with the utilisation of short-term NDVI time series as compared to constructed long-term NDVI time series are explained in more detail in Vrieling et al. (2014). An important aspect revealed by this study is that various NDVI products identify the occurrence of droughts in specific seasons. However, by looking at figure 1 on the comparison of different z-scored NDVI level and the two strike options (10% and 15%), it can be seen that the product would start to pay not only when zNDVI is greater than -0.6 (for the 10% strike) and -1.1 (for the 15% strike) but also in the case where zNDVI is greater than 1.6 and 2.1 respectively for a 10% and 15% strike level

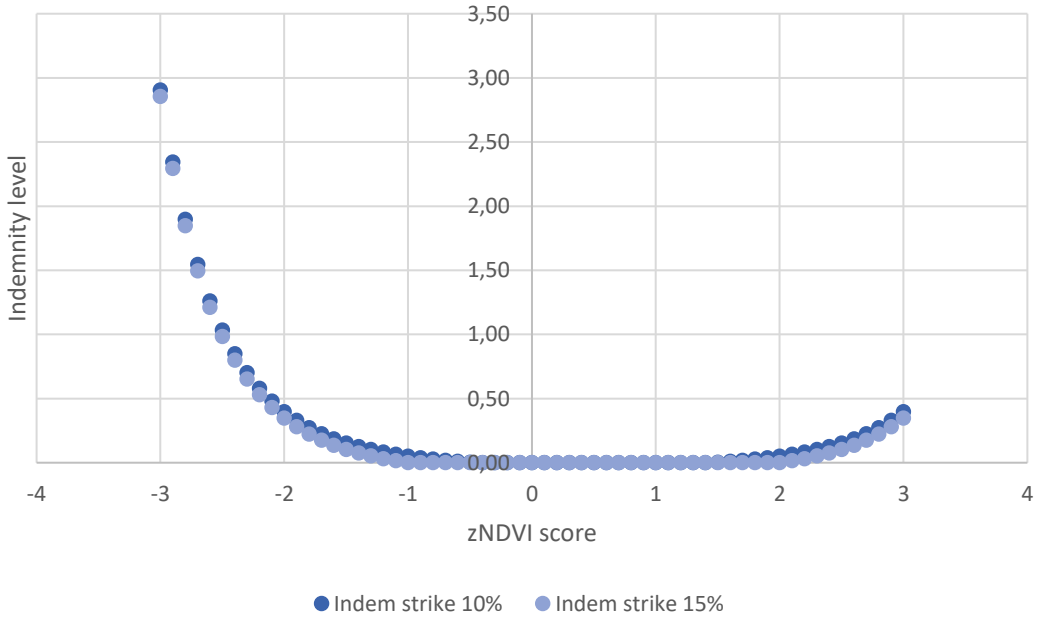

Figure 1: *Payout rate at either 10% and 15% strike level.*

(Source: Elaborated by the authors based on Vrieling et al. 2014)

Besides different technical constraints, lessons from IBLI have informed and supported the World Bank's design of the Government of Kenya's (GoK's) Kenya Livestock Insurance Programme (KLIP), a macro-coverage insurance scheme sponsored

(2) The extension of the MODIS time series from 13 to a 33-year MODIS+AVHRR time series with the methodology supported by the consultant from Twente University and the JRC (Vrieling et al., 2014);
(3) The use of a spatially lagged econometric model to map the derived remote sensing indicator to mortality.

The resulting index was then used for 108 divisions. as described in Woodard et al., 2014. The division-level model appears to be accurate in fitting (overall time/space R2 = 0.99). More statistics (including out-of-sample R2 by division) would be needed to evaluate more precisely the correlation between the proposed index and the mortality rates.

[11] IBLI expanded into Isiolo (August 2013), Wajir (August 2013), Garissa (January 2015), and Mandera (January 2015).

by the Ministry of Agriculture, Livestock and Fisheries (MALF). In contrast to the IBLI, which will remain a micro-insurance scheme that will continue to be sold on a commercial basis across northern Kenya, the government-sponsored livestock insurance scheme launched in October 2015 is intended to cover selected households in the counties of Wajir, Turkana, Marsabit and Mandera. The selected herders covered by the KLIP will receive a 100% subsidy of the product.

From a retailing point of view, the Village Insurance Promoters (VIPs) found that the major impediment to IBLI was the commission structure. It was estimated that the net revenue per contract was very low (BFA, 2013). This may have led to an overselling of the product in order to increase sales volumes. Indeed, the problem that IBLI faced in one of the sales windows was that agents hid some of the key characteristics of the product from the insured (they did not properly explain that there was a possibility of not receiving an indemnity in case of loss – basis risk)[12]. While a misunderstanding of product characteristics is common in index-insurance pilots (McIntosh et al., 2013), better knowledge of the product does not appear to substantially increase the uptake of IBLI (Takahashi et al., 2014).

Difficulties in launching a successful roll out of different sales are exacerbated by the difficult environment in which the product is piloted. Some of the factors that impeded scaling up are: low population density[13] and poor infrastructure, high cost of collecting premiums, lack of strong distribution partners with a strong brand – Equity, the report says, has that brand but is losing interest- and high costs of individual agents (BFA, 2013). Furthermore, Jensen et al. (2014b) show that in some areas the benefits of reduced exposure to covariate risk (an average of 62.8%) are offset by high exposure to idiosyncratic risk[14]. In this study, the authors found high variations in covariate risk between sublocations (from 15 to 40), meaning that some sublocations face more idiosyncratic than covariate risks. If this is the case, that is if drought does not represent the main widespread correlated risk, then the index insurance product is inappropriate, and alternative risk management mechanisms would produce more beneficial results.

3.2 *IBLI: sales performance*

The product is marketed and sold during two periods occurring directly before the two rainy seasons (August-September and January-February), with insurance coverage periods lasting one year and the potential for two indemnity payouts, one after each dry season. This means that for two consecutive purchases of IBLI there is an overlapped coverage period which might generate more than one payout.

Despite the continue expansion, sales figures have still not reached large scales; at the end of 2014, sales were still at a critical level. Overall uptake level across the different sales windows remains disappointing (ranging from 35% of the first sale

[12] Information collected during our field mission in Kenya.

[13] The more successful programmes in India operate at a density of 386 per square kilometre; the Index-Based Crop Insurance (IBCI) initiatives vary from 59 (Narok– Ololunga) to 743 per square kilometre (Murang'a South- Sabasaba), whereas IBLI varies from 2 (Marsabit Chalbi) to 9 per square kilometre (North Horr). BFA (2013).

[14] Covariate risks affect many enterprises simultaneously (e.g. major droughts or floods, fluctuating market prices), while idiosyncratic risks usually affect only individual farms or firms (e.g. plant and animal pests and diseases, illnesses of the owner or labourers). Jaffee et al. (2010).

in January-February 2011 to 4.7% of the last sale in August-September 2013).[15] Demand was found to be sensitive to discount coupons. This result is in line with those of Chantarat et al. (2009). They estimate that demand for IBLI falls by 55% when the fair premium rate is loaded by 20%; a further 26% reduction is expected with an additional 20% premium loading. Furthermore, the average number of livestock insured was 3 TLU in Kenya, which is far below the country averages of 17 and 12 TLU of livestock herded and owned. Additionally, the data show that in Kenya the number of TLU insured is constantly declining as shown in figure 2.

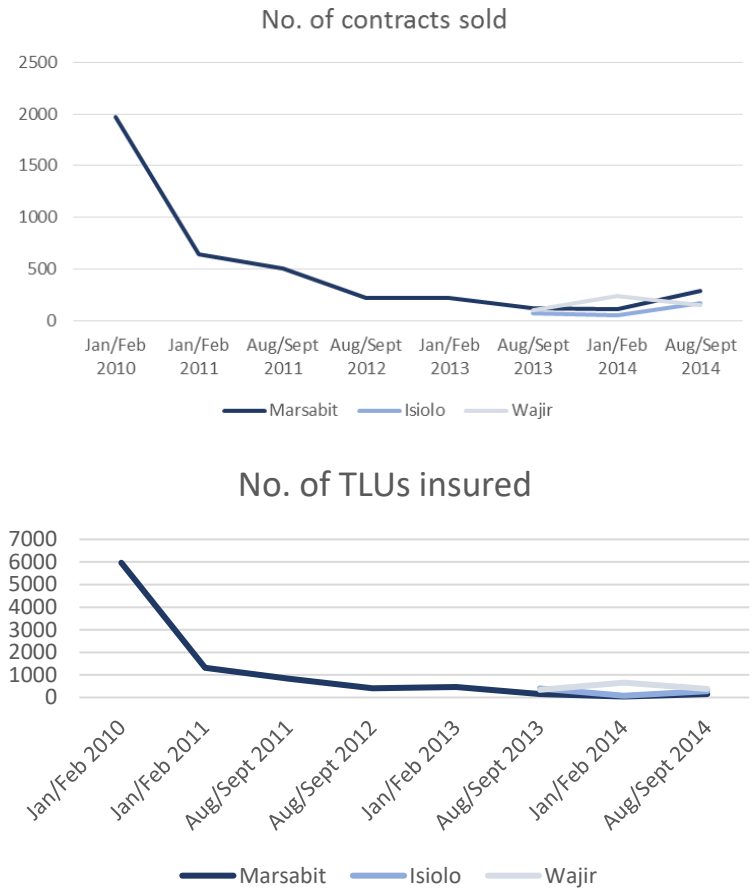

Figure 2: *Sales performance by season and location.*

Source: Elaborated by the authors based on Dror et al., 2015

However, sales of IBLI by the KLIP increased sharply in August/September 2015, when roughly 3,500 policies were sold. Although the coverage of the KLIP is still evolving, the focus has moved to asset protection. That is, the evaluation of the growing season is made during the season to allow for an earlier pay-out that should enable pastoralists to put in place measures to keep the livestock alive. While the product that is offered on a voluntary basis by the KLIP is completely subsidy-based (MALF set aside resources to provide a 100% subsidy to 5,000 selected herders) will in general boost awareness of IBLI, it may also suppress sales of commercial insurance products.

[15] Data from the Marsabit and Borena Household Survey

Detailed figures of the performance of IBLI are offered by the five-year (ten seasons) longitudinal household surveys launched in Marsabit in 2009. The Marsabit annual surveys collected socio-economic information in addition to details on IBLI sales for five different years, each covering 924 households. These data indicate that the uptake of IBLI was below expectations. Figure 3 shows the share of people purchasing insurance across the five different sales rounds by discount percentage[16].

Figure 3: *Share of herders insured by discount percentage received.*

Source: Elaborated by the authors based on IBLI datasets

With the exception of the first sales period, the share of insured herders is consistently below 20%. The leverage effect of coupons on purchases does not appear to be very strong.

Contrary to other types of finding, which show that aggregated demand for IBLI is considered to be very price elastic, with a 55% reduction in demand when the fair premium rate is loaded by 20%, and a further 26% reduction with an additional 20% premium loading (Chantarat et al., 2009)[17], we see that the increase in uptake associated with discount coupons is mostly marginal, in the range of 3-7%.

Most importantly, data show that interest in the product decreases over time, confirming the challenge of generating effective demand for the upscaling of the

[16] In each round, discount coupons were randomly distributed to a rotating sub-sample of 60% of surveyed households in each sub-location. Coupons range from 10 to 60% (80% in Round five), at an interval of 10, and can be used to get a discount on the premium for the first 15 TLUs insured

[17] The three main findings are: 1) large herd owners will be the key drivers of a commercially sustainable IBLI product; 2) small premium reduction (e.g. through subsidisation) can potentially lead to large increases in quantity demanded (i.e. a decrease in premium loading from 40% to 20% could potentially lead to more than a doubling of aggregate demand; 3) while IBLI appears to be most valuable for the most vulnerable pastoralists (those with herd sizes of around 10-30 TLUs), most of their willingness to pay (WTP) lies well below the commercially loaded IBLI premium (i.e. at least a 20% loading).

product. These results are in line with the findings of Jensen et al. (2014a), which report that "uptake was healthy during the first sales window (27.8% of the sample purchased), but has dropped off rather dramatically in the following sales periods." Hence, we cannot generally state that high-discount coupons are good predictors of uptake. On the basis of these results, we believe that subsidising the product 100% in order to increase understanding and thus uptake of the product is not an optimal choice. In this regard Skees and Collier (2012) by identifying a number of concerns regarding the provision of subsidies for moderate losses, have also highlighted the risk associated with the use of premium subsidies, which may undermine the long-term sustainability of the scheme.

Besides, by looking at the share of livestock insured at a discounted rate (Table 1), we found that, on average, less than 50% of the assets owned are usually insured. This level of insurance is still far below the global coverage that would insure people against catastrophic risks. A proxy of dissatisfaction is represented by the level of consecutive purchasing in the five consecutive rounds. Our analysis reveals that about 35% of the insured bought IBLI twice, but only 7% of them bought more than two times.

	Share of herded and owned livestock insured											
	Round 2		**Round 3**				**Round 4**		**Round 5**			
	Jan-Feb 2010		**Jan-Feb 2011**		**Aug-Sep 2011**		**Aug-Sep 2012**		**Jan-Feb 2013**		**Aug-Sep 2013**	
Discount Rate	%	n	%	n	%	n	%	n	%	n	%	n
0	45	(49)	44	(36)	35	(16)	34	(26)	34	(20)	27	(2)
10%	49	(28)	31	(12)	35	(14)	34	(10)	49	(4)	59	(1)
20%	43	(31)	36	(17)	42	(17)	38	(10)	29	(4)	57	(3)
30%	39	(30)	51	(19)	38	(16)	26	(11)	44	(3)	62	(4)
40%	40	(34)	46	(19)	56	(12)	61	(11)	52	(7)	63	(4)
50%	60	(36)	47	(17)	36	(24)	53	(8)	18	(8)	57	(4)
60%	49	(34)	51	(16)	32	(21)	28	(14)	62	(3)	51	(5)
70%	-	-	-	-	-	-	-	-	-	-	55	(8)
80%	-	-	-	-	-	-	-	-	-	-	50	(12)
Total	**46**	**(242)**	**44**	**(136)**	**38**	**(120)**	**38**	**(90)**	**37**	**(49)**	**54**	**(43)**

Table 1: Share of herded and owned livestock insured by discount

Source: Author's calculation based on the IBLI dataset (Marsabit).

The results suggest three important implications: i) the attractiveness of the product can vanish even in the presence of high-value discount coupons; ii) as the quantity of Tropical Livestock Units (TLUs) insured is too small to protect herders against covariate risks, many remain vulnerable to weather risks; iii) there is a growing disaffection on the part of the consumers, which leads to the product losing its attractiveness even in the presence of high-value discount coupons, probably due to

issues linked to product design rather than lack of economic means. This aspect should act as a warning bell for those interested in upscaling the product to a larger scale. Additionally, if we consider the limited knowledge about insurance among pastoralists, it would be difficult for any insurance product to improve market penetration unless efforts are made to improve marketing practices. Thus, to reach the high potential number of customers, it is also important to further improve product design (both in terms of minimising basis risk and improving marketing and delivery channels) or find alternative solutions that can minimise the drawbacks of the index. An embedded (and compulsory) product, such as that offered by Kilimo Salama[18], could be a valuable alternative approach to marketing IBLI. For instance, livestock vaccinations (already largely subsidised) could be tied to the insurance product so as to have a unique subsidised product. These steps have to be taken before attempting to move towards an expansion of pilots or an intensification of insurers' competition in the area

4. Research trends and alternative approaches

Despite several attempts to improve product design (reduce basis risk), positive results are still far from being achieved. While experience in India taught that increasing the number of weather stations will reduce specific basis risk problems (BFA, 2013), hybrid index/claims assessment (fall-back) [19] approaches are also expected to be developed (e.g. MiCRO in Haiti). Explaining the product as a protection against loss of yield or livestock might create false expectations, and high basis risk could generate distrust and disappointment. Furthermore, the issue of complex versus simple index insurance has been already discussed by many (i.e. Gommes and Göbel, 2013) and, while the tendency is to promote simple index insurance, this usually implies a loss of product efficiency.

While there are quite important and clear lessons to be learned from previous pilots, more can be learned from pilot programmes that pertain to meso-, and macro-index insurance products. Miranda and Farrin (2012) highlight the pros and cons of these products, and we remark that while remaining in the context of a community level it facilitates the understanding of the limits of the index and lessen the investment in extensive delivery mechanisms, macro-level products, such as the African Risk Capacity (ARC), have the great advantage of redistributing basis risk over a large geographic area, and can thus be less damaging than at the micro or meso level. Similarly, the impact of the KLIP on the commercial uptake of insurance will bring some insight into the effect of the public-private initiative of the GoK on macro-insurance for livestock.

[18] Kilimo Salama is an agricultural insurance initiative of the Syngenta Foundation for Sustainable Agriculture, and is now led by ACRE. It develops and distributes index insurance for farmers so that they feel confident in investing in quality seeds and fertiliser for their farms, and can access agricultural loans. The initiative has developed insurance products to cover a variety of crops against drought, excess rain, and disease.

[19] Claims assessment approaches that involve inspecting sentinel farms provide ground-truths for the index and serve as a fall-back mechanism when farmers incur losses. While it is still experimental, investigating the potential for subsidising 'basis risk insurance' would be beneficial. BFA (2013).

Basis risk is not, however, the only constraint in upscaling insurance. There are several challenging aspects that dampen the effectiveness of index insurance, and therefore new pilots should not be prioritised until innovation in the delivery approach and product design has been thoroughly worked out. On the contrary, the synergic effect of a combination of different risk management mechanisms, including micro-, meso-, and/or macro-insurance, remain an open area to be investigated. Attempts to develop a more integrated risk management framework have been made by IFAD and the World Bank (IFAD-PARM and RapAgRisk)[20], but there is still no general model that can identify options for risk management either by supply chain participants (individually or collectively) or by third parties (e.g. government). Understanding how to efficiently combine multiple strategies by categorising the instruments and prioritising interventions could be a preliminary step before endorsing any decision. In this regard, a cost-benefit analysis of different risk management mechanisms would help to understand not only the magnitude of investments in both infrastructure and delivery channels (endorsed by donors), but also the feasibility of scaling up insurance products compared to investments in other risk management mechanisms. So far, such an analysis has not been undertaken.

5. Conclusions

We commented on the issues related to index insurance as well as challenging aspects faced in different pilot projects that focus particularly on IBLI. While there have generally been many improvements from the technical point of view, a sustainable and scalable product is still lacking. The systematic commitment to piloting products has generated a degree of 'pilot-itis': products have been extensively piloted, but there is little evidence that they can become commercially sustainable and scalable. The general trend seems to be to incentivise pilots rather than make innovations in terms of concrete and long-term business thinking about the product. Such long-term measures could include, for instance, improving understanding of the needs of small-scale farmers and pastoralists, developing effective client communication strategies, encouraging private companies to invest adequate time and resources into building internal capacity, optimising the process of developing and introducing products, and reducing the number of players involved.

Data constraints must be considered when designing indices. Lack of data that are highly correlated with what is insured leads to imperfect product design which in turn translates into high basis risk. Managing basis risk comes up against the trade-off

[20] IFAD - PARM is developing a holistic framework, to which we could contribute by assessing the effectiveness of index insurance compared to other risk management mechanisms. Similarly, the methodology for a Rapid Agricultural Supply Chain Risk Assessment (RapAgRisk), developed by the Agricultural Risk Management Team (ARMT) of the World Bank, provides a system-wide approach for identifying risks, risk exposure, the severity of potential loses, and options for risk management either by supply chain participants (individually or collectively) or by third parties (e.g. government). It is designed to provide a first approximation of major risks, vulnerabilities, and areas that require priority attention for investment and capacity building. World Bank (2010).

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between more complex and precise versus simple and less precise indices. So far, in many pilot tests, simplicity has been preferred over complexity, although this has not helped to avoid problems of data consistency and representativeness. These considerations lead us to a first set of conclusions whereby we strongly invite academic researchers, multilateral international non-governmental organisations, and national governments to think about how to first overcome the physical constraints associated with the development of index-based products or how to best reduce the negative impact of imperfect products. In light of what we discussed, we do not think that index-based insurance represents a suitable solution for very low-income smallholder farmers at this stage for two reasons: effective indices require a strong and high quality network with long-term, clean, and internally consistent historical records (elements that are currently lacking in many African countries, including Kenya), and very complex indices make the product unattractive to poor smallholder farmers.

The low uptake and increasing disaffection of those that tested the product also impede the development of the market. We have seen that neither the provision of discount coupons nor the number of assets insured approach a level of commercial viability. In all IBLI sales rounds, the impact of coupons on uptake is mixed and is less effective with respect to people who have already tried the product. In the case of IBLI, the average uptake fell from 41% in the first sale to 10% in the last sale (August-September 2013).

This second set of considerations brings us to rethink the role of index insurance as a product to protect farmers/pastoralists, and particularly to improve their food security. It seems that the potential for developing the insurance market is not great under these conditions.

Furthermore, after several experiments and ambiguous results, national or international financial support becomes the main vehicle for addressing issues of affordability. In turn, sustainable funding mechanisms become the main concern for many decision-makers. The challenge of balancing the responsibility for providing support between governments and/or donors and the private sector is still unsolved. It is not clear to which extent public support should endorse the scalability of the product and, more importantly, to which extent this support should sustain the improvement of the product's efficiency. In the present document we questioned the long-term sustainability in terms of efficiency, feasibility and scalability. We tried to shed light on some challenges that have undermined the product scalability, although further studies are required to estimate the extent to which benefits associated with this product outweigh the costs. In addition, exploiting alternative forms of the same product or combining insurance with complementary mechanisms can lead to better and more satisfactory results.

In drawing our recommendations, we endorse the conclusions of the recent conference on Information for Meeting Africa's Agricultural Transformation and Food Security Goals (IMAAFS), which stated that: "Weather-indexed insurance (WII) should generally be assessed as part of an overall risk management strategic portfolio. The size of most WII pilots is often too small to make them financially sustainable without donor subsidies. And several practical limitations keep the uptake of these products by small scale farmers low, such as for example insufficient transparency and efficiency in payouts and limited consultation of farmers in the pilot design phase". It was also

mentioned that the best approach to managing agricultural risk is a holistic one; all mechanisms, including WII, should be assessed and combined most efficiently, with a better knowledge and use of community-based risk management strategies.

6. References

Awel, Y. M. (2015), *Risk preference or financial literacy?: Behavioural experiment on index insurance demand*. Maastricht : UNU-MERIT [u.a.].

Bankable Frontier Associates (BFA), (2013), Review of FSD's Index Based Weather Insurance Initiatives.

Binswanger-Mkhize H P, (2012), Is there too much hype about index-based agricultural insurance?, in *The Journal of Development Studies*, 48, 187–200.

Carter M.R.,(2011), Innovations for Managing Basis Risk under Index Insurance for Small Farm Agriculture, Ferdi, Policy brief B41.

Carter M. R., A. de Janvry, E. Sadoulet, and A. Sarris, (2014), Index-based weather insurance for developing countries: A review of evidence and a set of propositions for up-scaling. Working Paper.

Chantarat S., A.G. Mude and C.B. Barrett, (2009), Willingness to Pay for Index Based Livestock Insurance: A Field Experiment from Northern Kenya. Working Paper, Cornell University.

Chantarat S., A.G. Mude, C.B. Barrett, and C.G. Turvey, (2010), The Performance of Index Based Livestock Insurance: Ex Ante Assessment in the Presence of a Poverrty Trap. Mimeo.

Chantarat, S., A.G. Mude, C.B. Barrett. and M.R. Carter, (2013), Designing Index-Based Livestock Insurance for Managing Asset Risk in Northern Kenya. *Journal of Risk and Insurance*, 80, 205–237.

Clarke D., (2012), What have we learned from all the agricultural microinsurance pilots? Blog available at http://blogs.csae.ox.ac.uk/2012/11/what-have-we-learned-from-all-the-agricultural-microinsurance-pilots/

Clarke D., and S. Dercon, (2009), Insurnace, Credit and Safety Nets for the Poor in a World of Risk. New York: United Nation, Department of Economics nad Social Afairs, Working paper 81.

de Leeuw J., A.Vrieling, A. Shee, C. Atzberger, K.M. Hadgu, C.M. Biradar, H. Keah and C. Turvey, (2014), The potential and uptake of remote sensing in insurance. A review. *Remote Sensing* (6),10888–10912.

Fuchs, A., and R-C. Lourdes, (2011), Voters Response to Natural Disasters Aid: Quasi-Experimental Evidence from Drought Relief Payment in Mexico, University of California at Berkeley.

GlobalAgRisk, Inc., (2011), Market Development for Weather Index Insurance Key Considerations for Sustainability and Scale Up. Innovation in Catastrophic Weather Insurance to Improve the Livelihoods of Rural Households.

Gommes R, and W. Göbel, (2013), Beyond simple, one-station rainfall indices, *In The challenges of index-based insurance for food security in developing countries*. Luxembourg, Publications Office of the European Union, JRC77278. Pp 205-221.

Gunning J.W., (2012), *Risk Management and Coping Mechanisms in Developing Countries,* (External report, Commissioned Review), London: Foresight, Government Office for Science.

Hess U., (2007), Weather Index Insurance for Coping with Risks in Agricultural Production. In Sivakumar, M. V. K.; Motha, R. P. (eds.): Managing Weather and Climate Risks in Agriculture. Berlin: Springer Verlag.

Hess U., and P. Hazell, (2009), *Sustainability and Scalability of Index-Based Insurance for Agriculture and Rural Livelihoods*. IFPRI 2020 Focus 17, Brief 5. Washington, DC: International Food Policy Research Institute.

Vargas Hill R. and M. Torrero (eds.), 2009, *Innovations in Insuring the Poor*, IFPRI 2020 Focus 17, Brief 5. Washington, DC: International Food Policy Research Institute.

IFAD, (2010), The potential for scale and sustainability in weather index insurance for agriculture and rural livelihoods.

Information for Meeting Africa's Agricultural Transformation and Food Security Goals (IMAAFS) Key Conference Findings and Conclusions *1-3 October 2014 UN Conference Center, Addis Ababa, Ethiopia.*

Jensen N., A. Mude, and C.B. Barrett, (2014a), How Basis Risk and Spatiotemporal Adverse Selection Influence Demand for Index Insurance: Evidence from Northern Kenya. Working paper, Cornell University.

Jensen N.D., C.B. Barret, and A.G. Mude, (2014b), Basis Risk and the Welfare Gains from Index Insurance: Evidence from Northern Kenya, *MPRA Paper No. 59153*, http://mpra.ub.uni-muenchen.de/59153/.

Gommes, R, and W. Göbel, 2013, Beyond simple, one-station rainfall indices, In *The challenges of index-based insurance for food security in developing countries*, Publications Office of the European Union.

Johnson L., (2013), Index insurance and the articulation of risk-bearing subjects *Environment and Planning* 45(11) 2663 – 2681.

Leeuw J.D., A. Vrieling, A. Shee, C. Atzberger, K.M. Hadgu, C. Biradar, H. Keah, C. Turvey, (2014), The Potential and Uptake of Remote Sensing in Support of Insurance: a review. *Remote Sensing*. 6, no.11: 10888-10912.

Manuamorn O.P., (2007), Scaling-Up Micro Insurance: The Case of Weather Insurance for Smallholders in India, Agriculture and Rural Development Discussion Paper 36. Washington, DC: World Bank.

Mills C. J., Nathaniel D.J., Barrett C.B., Mude A.G., (2015), Characterization for Index Based Livestock Insurance, IBLI publication.

Miranda M.J., and K. Farrin, (2012), Index Insurance for Developing Countries, *Applied Economic Perspectives and Policy* 34(3), 391–427.

Sina J., and P. Jacobi, (2012), Index-Based Weather Insurance -International & Kenyan Experiences. Kenya: Adaptation to Climate Change and Insurance (ACCI).

Skees J.R., (2008), Innovations in Index Insurance for the Poor in Lower Income Countries, *Agricultural and Resource Economics Review* 37(1), 1-15.

Smith V.H., and J.W. Glauber, (2012), Agricultural insurance in developed countries: where have we been and where are we going? *Applied Economic Perspectives and Policy,* 34(3), 363–390.

Vrieling A., M. Meroni, A. Shee, A., Mude, J. Woodard, K. de Bie, F. Rembold, (2014), Historical extension of operational NDVI products for livestock insurance in Kenya. *International Journal of Applied Earth Observation and Geoinformation,* 28, 238-251.

Woodard et al., 2013. A Spatial Econometric Approach to Designing and Rating Scalable Index Insurance in the Presence of Missing Data, CSAE conference 2014 (https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=CSAE2014&paper_id=709), under review; J. of Risk and Insurance.

Washington R., M. Harrison, D. Conway, E. Black, A. Challinor, D. Grimes, R. Jones, A. Morse, G. Kay, M. Todd. 2006, African climate change: taking the shorter route, *Bulletin of the American Meteorological Society*, 87 (10):1355-1366.

World Bank, (2005), Managing Agricultural Production Risk: Innovations in Developing Countries. Report No. 32727-GLB. The World Bank, Agriculture and Rural Development Department (ARD), Washington, DC.

World Bank, (2011), Weather Index Insurance For Agriculture: Guidance For Development Practitioners.

FOOD, FEED AND FUEL
A CONFLICT IN THE USE OF AGRICULTURAL SOILS

Vittorio Amato*

Abstract

The debate on biofuels in last years has mainly focused on environmental and energy issues at least until they have begun to emerge concerns about the effects of such practices on the agricultural markets and on the prices of the main products. In other words, the use of biofuels has been intended, in the current opinion, as a solution with a particular value in the energy and environmental perspective rather than an issue of strictly agricultural relevance. It follows that the same policies for the promotion of this sector were intended mainly as energy and environmental policies. This is because on the one hand biofuels are potentially a very interesting alternative to fossil fuels, and for the other they contribute not only to solve a problem of energy supply -especially for countries depending on imports- but also a problem of environmental nature, due to the excessive emission of greenhouse gases, with the consequent effects of global warming and climate change. The paper analyzes the complex geography of production and consumption of biofuels and comes to the conclusion that what appears altogether overlooked is the combined effect of all the possible causes of the food crisis and rising prices. In particular, in the context of a reduction in cereal stocks for years at a global level, is not to be excluded that the impact of biofuels, seemingly minor from the quantitative point of view, together with the expectations of their growth, has been precisely at the origin of a large-scale speculative wave.

1. Introduction

As a preliminary point, it should be stressed that the debate on biofuels has focused mainly on environmental and energy issues, at least until it began to arise doubts about the effects of such agricultural practices on markets and prices of the main products. In other words, that of biofuels is intended, in the current opinion, as a solution with a value from the energy and environmental profile rather than a topic of strictly agricultural importance. It follows that the very promotion policies in this field were intended primarily as energy and environmental policies. This is because biofuels on the one hand are potentially a very interesting alternative to fossil fuels, (especially for transport fuel for which alternatives are struggling to emerge) and on the other contributes not only to solve an energy supply problem - especially for countries dependent on imports - but also an environmental problem. Namely the excessive emission of greenhouse gases with the consequent effects of global warming and climate change. Their validity and criticality should be assessed, therefore, precisely in connection to the energy and environmental contribution that they can give.

About it, though, it should be shed light on some aspects. First, the global energy demand is such that, even if it was to be used for energy purposes the entire production of crops which are today used to produce biofuels, this would result, however, in a modest contribution. After all, biofuels are only part (about 2%) of the largest set of the so-called bio-energy (or energy from biomass) that, in turn, is a part (about 70%) of the

so-called renewable energies. The latter, at present, cover a limited portion of global needs estimated at about 18% and this leads to point out that biofuels, today, contribute to only 0.3% of global needs. To look at biofuels as a "general" solution to the energy problem can be, therefore, misleading.

Similar reasoning applies to the environmental contribution that can be expected from biofuels. The IPCC reminds us that the share of emission of greenhouse gases attributable to the transport (the consumption of fuels for automotive purposes) does not exceed globally 15% of the total emissions. It is true that this share can reach and exceed 20% in most developed countries (for example, in the EU), but it is still a limited portion. The replacement of 20% or 10% of fossil fuels with biofuels over the next 10-15 years (targets that have given the US and the EU, respectively), while sounding very ambitious, will, at best, help to reduce emissions of 5%. To get an order of magnitude, consider that the only agriculture (excluding deforestation and therefore considering only crops and agricultural practices that result in emission) is given a quota of emission of 15%. From the point of view of the primary sector, then, an equally valid result in environmental terms could be obtained, in place of the production of biofuels, through a reduction of 30% of agricultural emissions of greenhouse gases or, to an even greater extent, increasing the so-called "carbon sequestration capacity" by agricultural activities using more conservative techniques. Finally, a very important point to emphasize is that, in terms of reduction of emissions, the real energy and environmental contribution that biofuels can provide is not at all univocal. This depends, in fact, both from the raw material used and from the process by which they are obtained and used.

Throughout the supply chain that goes from the cultivated field until the gas station, the production of biofuels, in fact, requires itself energy and, therefore, contributes in turn to increase greenhouse gas emissions. To understand the energy and environmental net contribution of these products it would be necessary to conduct a careful Life Cycle Assessment, case by case, based on the feedstock used and the final product obtained.

Must then be highlighted the problems triggered in the use of agricultural products throughout the production chain which are not necessarily mutually exclusive. Some applications, in fact, are complementary being some based on by-products of the others. This is particularly true, and it is matter of great importance, in relation to the feed uses (intended for animal feeding) and fuel (energy) of most of the crops used as biofuels. In fact, the fuel production is not an alternative to the production of feed; the two things can go together since the energy use extracts only a part of the product while the rest can be addressed at least for animal feed. Being each other's by-product there is no real competition between fuel and feed, but the real competition exists, conversely, between fuel and food exactly as exists between food and feed. This is clearly true in a first and gross approximation; in fact, the feed obtainable from corn or soybeans after extracting the raw material for the fuel use is not the same, having lost important nutrients; therefore, it has less nutritional and economic value and must be properly integrated. Nevertheless, must be kept in mind that in the production reality of these chains, the flexibility and technological advances achieved make the ratio of substitution and complementarity between different uses anything but trivial.

In the light of these considerations, is quite legitimate to ask whether the side effects of negative type that the development of biofuels may have generated (and may in the future generate) in agricultural markets are indeed a necessary price to pay to get an

environmental and energy benefit that, although strategic and of global interest, is far from certain, and not necessarily of great magnitude. Basically, it is quite questionable whether the policies of promotion of biofuels are indeed policies that contribute to the increase in the overall well being of a nation and/or the entire world population.

2. Geography of the productive chains

Whether and how the factors that are concatenated in the growth of the biofuel industry generated cascading effects in agricultural markets, it depends substantially on the price transmission system and the substitution and complementarity relations between different products. In other words, what must be taken into consideration is the structure of the production chains. The answer about the pursuit of incentive policies in the production and use of biofuels cannot, therefore, be given in the abstract, but must necessarily be dropped in the specific of the agro-energy supply chains that arose.

The first thing to note is that the geography of the bio-fuels industry, globally, is made mainly from three supply chains: firstly, ethanol from sugar cane in Brazil, then ethanol from corn in the United States and finally biodiesel mainly in Europe (but mainly in Germany, which produces more than 50%). These are, in fact, the only productive chains that currently show a certain quantitative significance and the rest, to the state, has very limited size and, consequently, could not have played any role in the performance of the markets and agricultural prices worldwide.

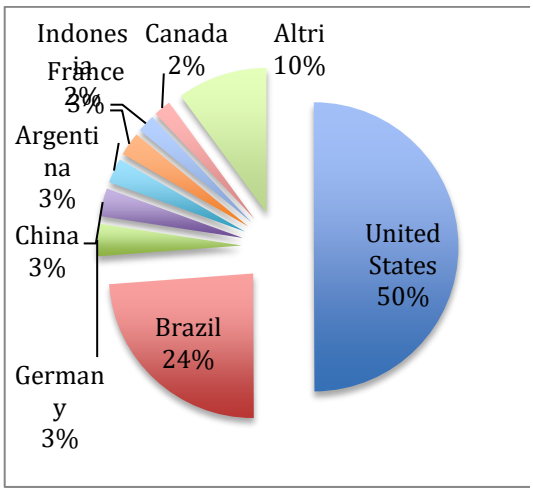

Figure 1: Percentage shares in the production of biofuel.

(Source: elaboration on data United States Energy Information Administration)

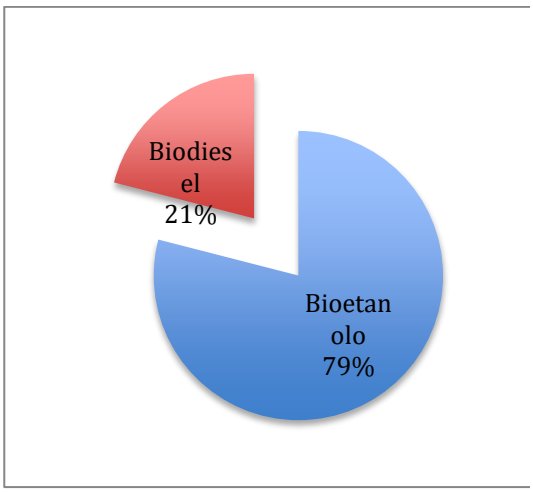

Figure 2: World percentage of biodiesel and bioethanol

(Source: elaboration on data United States Energy Information Administration)

It is appropriate, therefore, to analyze in more detail, which are the countries, the agricultural products and the trade relations that, even in recent years, have generated and consolidated these three chains.

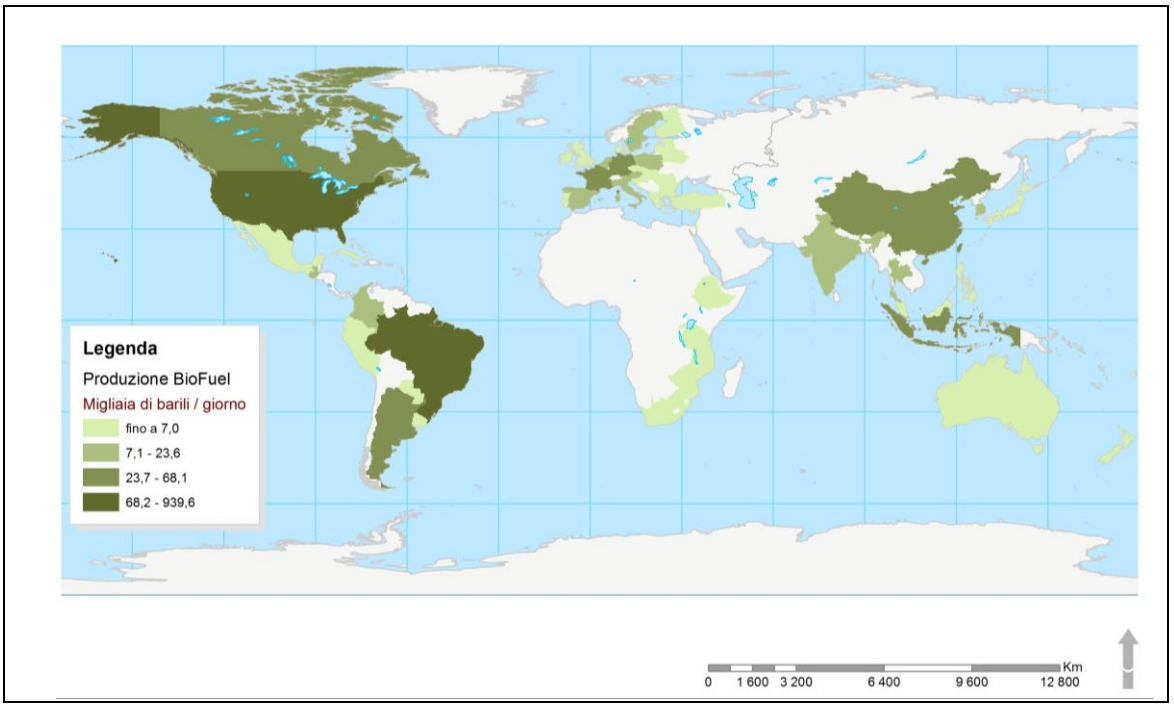

Figure 3: Biofuel production by country

(Source: elaboration on data United States Energy Information Administration)

3. Geography of productions

The production of biofuels worldwide is heavily concentrated in a few large areas attributable to the US, Brazil, and the EU and, if we consider separately bioethanol and biodiesel, this concentration is even more pronounced, being the expression of different agricultural specialization of the various countries. This concentration and specialization is not only a "dimensional" illusion, namely linked to the size of their respective economies and agriculture. So much so, that big countries and agricultural powers such as China, Russia, Australia and Argentina, show, on the contrary, limited developments in biofuel production quantities.

What led the United States, Brazil and the EU to be the absolute leader in this field is, rather, due to specific energy and environmental policy decisions, albeit with different timing and mode. The picture that emerges from the data available in the OECD-FAO dataset is quite clear and can be summarized in a few points:

- The production of bioethanol is clearly prevalent than that of biodiesel (respectively, 79% and 21% of the total).
- The share of US, Brazil and EU is very high, especially for bioethanol (approximately 95%) but also for the bio-diesel (about 80%).

- More than 75% of global production of biofuels is concentrated in Brazil and the USA in almost equal proportions. The great part is made up of bioethanol (in the two countries, the share of biodiesel is about 0.1 to 6% of the total, respectively).

- About 11% of world production of biofuel is made from the biodiesel manufactured from the EU (which, by itself, generates more than 60% of the world production of biodiesel).

- In the EU, biodiesel production is highly concentrated in Germany (about 50%) and France (15%). These same two countries also hold the highest bioethanol production quotas.

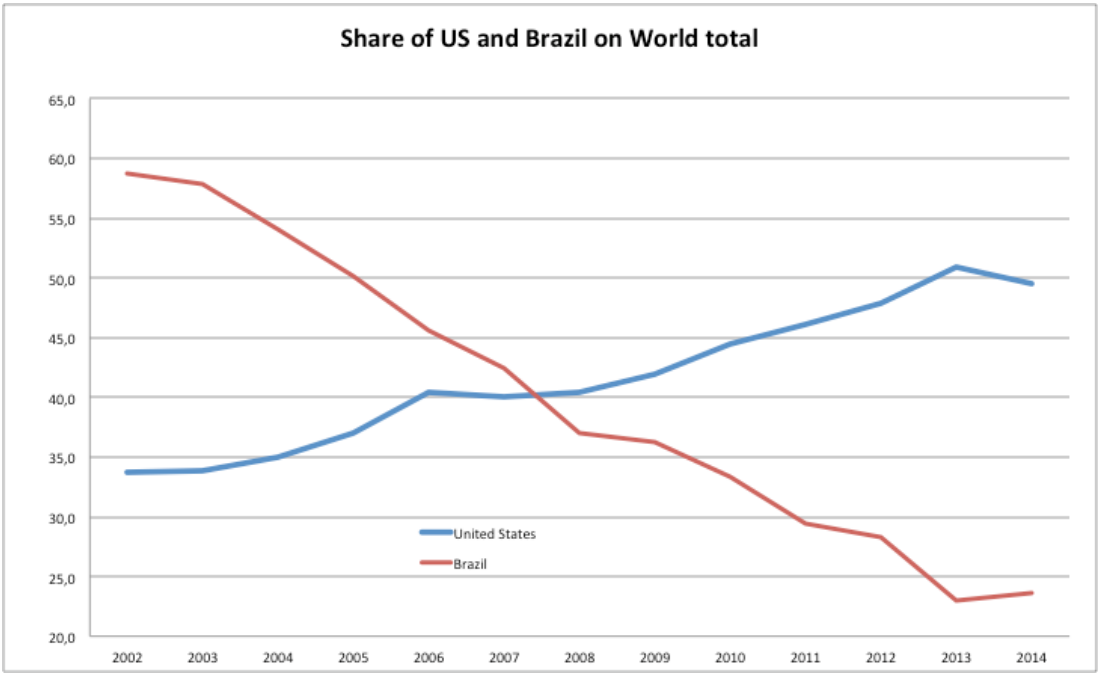

Figure 4: Share of US and Brazil on World total

(Source: elaboration on data United States Energy Information Administration)

The clarity of these data in terms of high concentration and specialization is likely, however, to conceal significant changes in production scenarios observable over the years. First, since 2006 the US has surpassed Brazil in the production of bioethanol. In the latter country, as is known, production has been consolidated over time as early as the seventies and has continued to grow even in recent times though at fairly limited rates.

Conversely, the production of bioethanol was negligible in the US until the end of the nineties and has grown sharply in the very years closer to us. It follows, then, that the US started to be firmly the leading bioethanol producer in the world. The EU leadership in biodiesel production has consolidated in recent years, but it is less clear whether in the near future, Europe's share will strengthen further as in the case of bioethanol for the United States since they have recently undertaken a significant development also of biodiesel production (about 15% of the world total) and part of this production is exported to the EU itself.

More generally, although the respective global levels are still very low, several other major agricultural countries face in these productions (both bioethanol and biodiesel) with high growth rates: in particular, China, Australia and Argentina, in addition to Canada, India, Colombia, Indonesia, Thailand. In all these countries, in addition to domestic demand, to be a matter of interest is the presence of important outlet markets linked to exports.

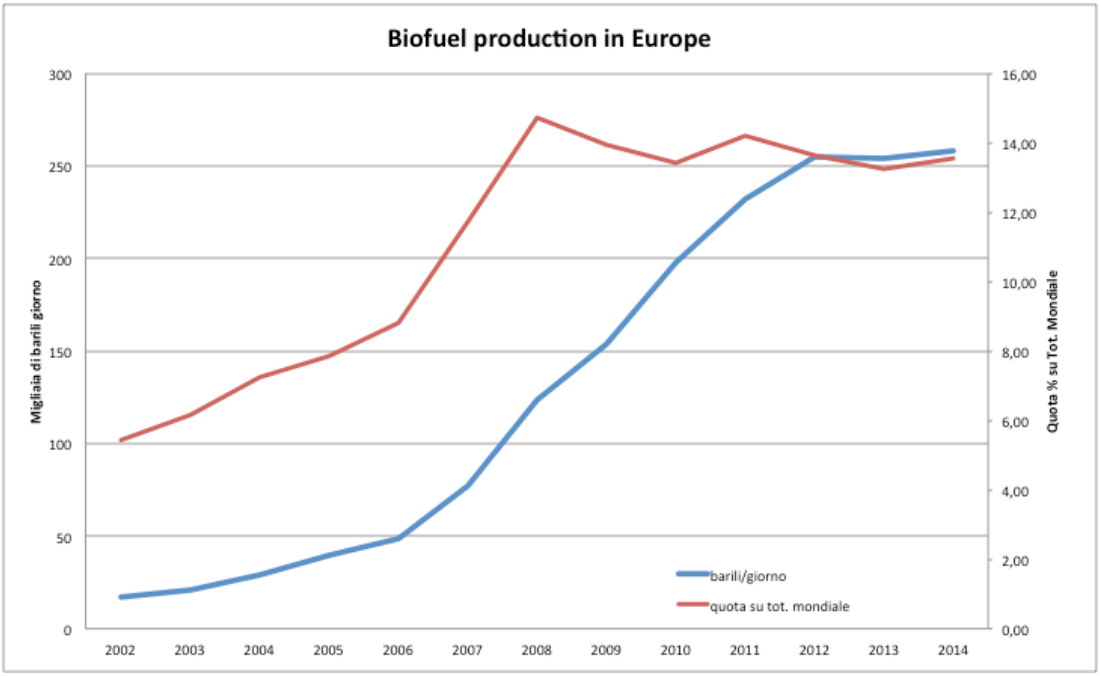

Figure 5: Biofuel production in Europe

(Source: elaboration on data United States Energy Information Administration)

In Europe, the balance of forces now appears consolidated with Germany and France than before and more than others have focused on these sectors, though with differentiations outlined above, but it should be emphasized that the increased presence of these countries is not necessarily attributable to a higher agricultural matrix. About production of corn seeds and oleaginous Italy and Spain, for example, have surfaces and volumes which would allow similar performance in the production of biofuel. It is rather the industrial component (energy, but also automotive and food industries) and the entire agroenergetic supply chain to have organized the first in this direction, accompanied by national policies to promote the sector. Therefore, if and how much the biofuel market will be growing in the coming years is unlikely that these relations of force can be changed in the short to medium term.

4. The raw materials

The high concentration by country determines also a strong crop specialization because, at present, there are few crops that contribute significantly to the production of biofuels. They are, essentially, only two significant crops about the bioethanol, namely

the sugar cane in Brazil and corn in the United States. The proportions between the two have remained in time substantially constant at around 75% and 20% while the remaining 5% is represented by other crops (cassava, sugar beet, wheat, barley, etc.). As for the production of biodiesel, rapeseed (prevalent in the EU) it is now about 85%, so it has the majority compared to other vegetable oils (soybean and sunflower, 13%, palm oil, 2%).

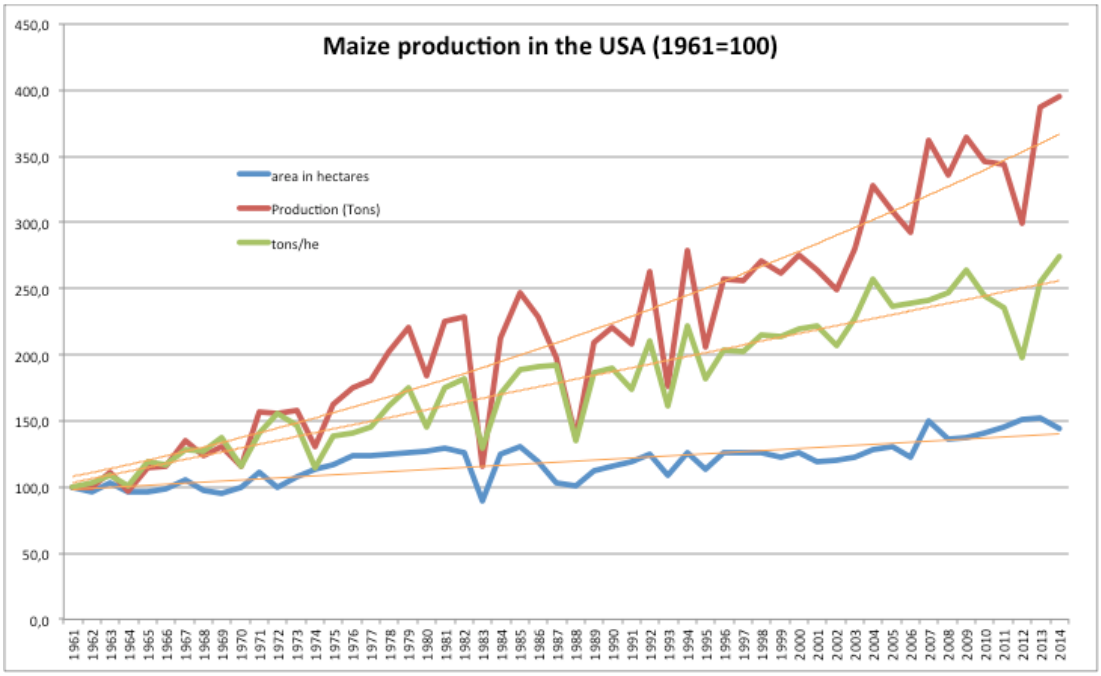

Figure 6: Maize production in the USA

(Source: elaboration on data Faostat)

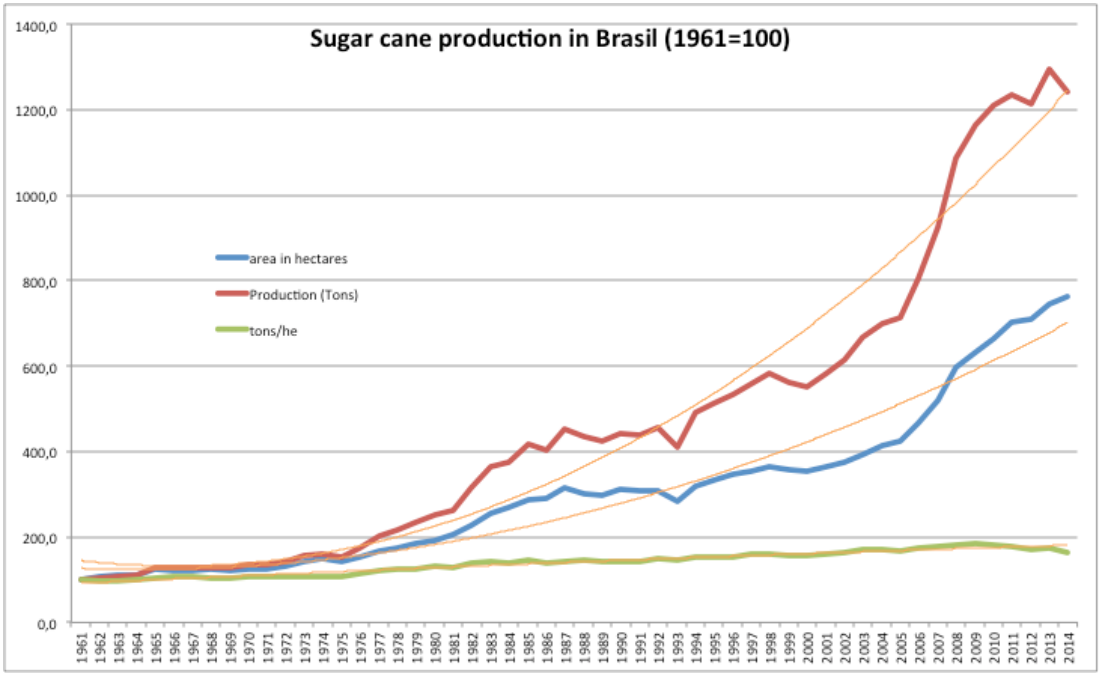

Figure 7: Sugar cane production in Brazil

(Source: elaboration on data Faostat)

Basically, therefore, the agricultural matrix of the biofuel business concerns mainly three crops: sugar cane, corn and rapeseed which are typically industrial crops, with multiple uses and weak relevance, at least in a direct way, for what concerns human nutrition. This means that none of these crops is essential to the livelihoods of populations in conditions of underdevelopment because even corn has, by now, a share of marginal use as food worldwide. It is also true that maize is a crop of major importance for animal feed, and that the sugar cane is the most important crop, and economically advantageous, to produce sugar. Difficult to think, however, that their fuel use may endanger the existence of entire populations and food self-sufficiency. Even in this case, however, only photographing the existing scenario may provide a misleading representation of reality. In fact, in recent years (and even more in the future) it has grown the use of other crops such as soybeans (in the US, Brazil, Argentina and the EU itself) and palm (in the countries of Southeast Asia) regarding biodiesel, whereas, especially in the European Union, it is expected to grow the involvement of the wheat and barley crops to produce ethanol, as well as cassava in the case of the southeast Asian countries. It comes, in these cases, of crops whose implications in the food supply, particularly in some geographical areas, may be more relevant and direct.

The different agricultural matrix in the production of biofuels in the various countries involved, not only explains the relative specialization (bioethanol in the US and Brazil, bio-diesel in the EU), but above all generates very important implications about the evolution of this sector and the competitive performance of its protagonists. Although there is no differentiation of the product, since the final product is indistinguishable (bioethanol or biodiesel, that is), there is a substantial difference in the production process, from the field to the distributor, precisely in relation to the involved agricultural matrix. For each crop, in fact, you can associate a different economic convenience, a different energy efficiency and a different environmental impact, and, finally, different implications in terms of food self-sufficiency. In particular, in terms of economic convenience, are more profitable those crops that produce greater quantities of substance useful for processing into fuel namely high yields.

In general, it is possible to establish a ranking of crops with which to associate the country of reference namely the one which makes the most use to produce biofuels, but this ranking of economic convenience also results in a ranking of competitiveness among countries. In terms of cost, the Brazilian ethanol (obtained from sugar cane) is more competitive than that from corn of Use or that of the of EU from wheat, as well as the biodiesel from rapeseed or soybean of EU and US. This reveals that only protectionist policies to restore economic convenience for the bottom of the league crops (thus for of EU and the US) can keep alive, in the long run, or in the presence of international trade, supply chains based on a non-competitive agricultural matrix.

5. International Trade

Of the consolidation of positions on the biofuels market and related competitive advantages is already possible to find some evidence in international trade. This, in fact, is still very weak for biofuels, especially in the case of bioethanol, because of the major barriers and existing technological issues at various levels. However, two trade flows

are already established and prevailing today: that of bioethanol from Brazil to the United States and that of biodiesel from various countries of origin (mainly United States) to the European Union. In the latter case, in recent years they begin to operate also Asian countries, especially with the production of biodiesel from palm oil. The OECD-FAO data shows that, in the case of ethanol as much as 80% of global net exports is the prerogative of Brazil (about 3 billion liters of exports), while the rest is all to the advantage of China; much less concentrated are the destinations (net imports) that still see the United States in first place with 38% and Japan in second with 17%: together they contribute to 55% of the world's net imports.

Conversely, in the case of biodiesel, the largest share for exports it is for to the United States with 38%, but significant are the values of Indonesia, Argentina and Malaysia. The EU is the main destination (41%; about 0.5 billion liters of imports), followed by Japan. These are data that should not be certainly emphasized, because it is still quite low volumes. Than, say, other energy products such as oil and natural gas, exchanges are still limited although there appears to be quite clear productive specialization. In particular, compared to the volumes produced it is the bioethanol business that seems underdeveloped. The ratio of net production and exports, by volume, accounts for a mere 2%. This value is quite low when compared with energy products, but also with many agricultural products and with the same biodiesel, which has a ratio of 13%.

Among the reasons for this limited development of trade there is certainly to consider the presence of high trade barriers especially regarding the ethanol and in countries where the growth of domestic demand leaves ample space to the product coming from the outside (the USA, first and foremost, but also the EU). On the other hand, precisely the development of a nascent industry driven by domestic demand would justify trade barriers that the US and EU put on bio-ethanol from Brazil, where the industry is now well established and widely competitive.

6. The impact of biofuels on agricultural markets

Given the state and prospects in the brief description field you can go back to the original question, namely whether and to what extent the strong growth of biofuels is or is not responsible for the growth of prices of agricultural products. As mentioned earlier, the answer would seem to be yes, because there is no doubt that this growth increases the demand for agricultural commodities and thus tends to increase, other things being equal conditions, the relative prices. The real problem, though, is to understand how strong is the impulse for further price rises.

In relation to the latter, in an attempt to simplify, it can be said that are substantially emerged two theses, whose conflict has fuelled a debate on the guidelines to be followed, debate that has turned of even very harsh tones.

A first position can be brought back to the point of view that emphasizes the competition that exists between food use and fuel use of these agricultural products. It reiterating the moral leadership of the first, it stresses that the growth of fuel use has created a crisis of food supply in the use plausibly at the base of the sharp rise in

agricultural prices observed globally. On this front, can be counted several international institutions (World Bank, International Monetary Fund, the same FAO) as well as influential politicians; all, in some way, united by the belief that the biofuel promotion policies pursued by the United States and the European Union have played a role in making unstable world agricultural prices and cause it to rise and, therefore, convinced that such policies should be promptly and seriously modified. About it suffices to say that the International Monetary Fund estimates that biofuels have caused 70% of the increase in maize prices and 40% of soybean.

The second position, which even the EU has become a spokesman, is based on the assumption that the causes are much more macroscopic and complex than the "contingency" represented by the growth of biofuel production, scaling up the impact of the growth of the latter on agricultural prices but certainly not denying it. In this perspective, the impact of biofuels is seen as a minor effect compared to much more important phenomena that would have contributed to the surge in prices. The real "imputed", then, would be other: the growth of food demand in emerging countries that, among other things, is accompanied by a change of diet that most favours meat resulting in a growing demand for animal feed; a decrease in supply, mainly cereals, in some major producing areas (Australia, Russia and Canada) due to unfavourable climatically years which, however, may in part be attributed to a structural change of the climate itself because of the greenhouse effect (the very thing that biofuels would help to contain); the rise in oil prices which is reflected on agricultural costs and therefore on prices; speculation, because in these markets, given the difficulties of the financial markets, have been poured huge amounts of resources and considerable speculative interests.

Is interesting to note the US government also shares a very similar position to that on several occasions expressed by the European Commission. Mischievously one can think that both governments consider it appropriate to defend their highly favourable decisions for biofuels just resizing its role in the so-called food crisis. To some extent, it is surprising the strong divergence of views on this matter, because the same international organizations, which also should not have to defend political or government interests, have, in turn, every interest to point out as wrong national policies guilty rather than their own analysis and their tools not always effective.

In conclusion, what seems altogether underestimated is the combined effect of all possible causes of the food crisis and the rise in prices. In particular, in a context of reduction in cereal stocks for years on a global level, it is not inconceivable that the apparently minor impact from the point of view of biofuels, together with the growth expectations that accompany them, it was precisely the origin of the primer of a speculative wave of large size.

7. References

Bodman S.W. (Secretary of Energy), Schafer E. T. (Secretary of Agriculture) (2008), *Responses to Questions from Senator Bingaman*, Committee on Energy and Natural Resources, United States Senate, Washington, DC, 11 June. Available at:

http://www.gpo.gov/fdsys/pkg/CHRG-110shrg44816/html/CHRG-110shrg44816.htm

Commissione Delle Comunità Europee (2006), *Comunicazione della Commissione. Strategia dell'UE per i biocarburanti*. COM(2006) 34 final, European Commission, Brussels, 2006. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2006:0034:FIN:IT:HTML

Commissione Delle Comunità Europee (2006), *Comunicazione della Commissione al Consiglio e al Parlamento Europeo. Tabella di marcia per le energie rinnovabili Le energie rinnovabili nel 21° secolo: costruire un futuro più sostenibile*. COM(2006) 848 final, European Commission,. Brussels, 2006. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2006:0848:FIN:IT:HTML

European Commission (2008), *High prices on agricultural commodity markets: situation and prospects. A review of causes of high prices and outlook for world agricultural markets*, European Commission, Directorate General for Agriculture and Rural Development, Brussels, july 2008. Available at: http://ec.europa.eu/agriculture/analysis/tradepol/worldmarkets/high_prices_en.pdf

European Commission (2008), *Agricultural commodity markets outlook 2008-2017*, European Commission, Directorate General for Agriculture and Rural Development, Brussels, 31 july 2008. Available at: http://ec.europa.eu/agriculture/analysis/tradepol/worldmarkets/outlook/2008_2017_en.pdf

Esposti R. (2009), *I biocarburanti tra mercati internazionali, politiche e Wto*, in "QA Rivista dell'Associazione Rossi-Doria", n. 4, pp.57-93.

FAO, *Food Outlook. Global market analysis*, years 2007-2011. Available at: http://www.fao.org

FAO, *The state of food and agriculture, 2008. BIOFUELS: prospects, risks and opportunities*, Roma, 2008. Available at: http://www.fao.org/publications/sofa-2008/en/

FAPRI, *World Biofuels: Fapri 2008 Agricultural Outlook*, Columbia, MO, 2008. Available at: http://www.fapri.iastate.edu/outlook/2008/

Grayson M. (2011), *Supplement Biofuels*, in "Nature", 474, No.7352, pp. S1-S43, 23 June 2011.

Hebebrand C., Laney K. (2007), *An Examination of U.S. and EU Government Support to Biofuels: Early Lessons*, IPC Issue Brief 26, International Food & Agricultural Trade Policy Council, Washington, october 2007. Available at: http://www.agritrade.org/Publications/EU_US_Biofuels.html

IMF (2008), *Commodity Prices and Global Inflation*. International Monetary Fund (IMF), Washington, DC, 2008. Available at: http://www.imf.org/external/np/speeches/2008/050808.htm

IEA (2004), *Biofuels for transport: an international perspective*. Paris, OECD/IEA. Available at: www.cti2000.it/Bionett/All-2004-004%20IEA%20biofuels%20report.pdf

IPCC (2007), *Climate Change 2007: Synthesis Report*, Ginevra: Ipcc, 2007. Available at: www.ipcc.ch/.../publications_ipcc_fourth_assessment_report_synthesis_report.htm

Koizumi, T. (2013), *Biofuel and food security in China and Japan*, in *"Renewable and sustainable energy reviews",* n. 21, pp. 102-109.

Mitchell D. (2008), *A Note on Rising Food Prices*, Policy Research Working Paper 4682, The World Bank, Development Prospects Group. Available at: http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2008/07/28/000020439_20080728103002/Rendered/PDF/WP4682.pdf

OECD-FAO (2008), *Oecd-Fao Agricultural Outlook 2008-2017*, Paris, 2008. Available at: www.fao.org/es/esc/common/ecg/550/en/AgOut2017E.pdf

OECD-FAO, *Agricultural Outlook Database*. Available at: http://www.oecd.org/site/oecd-faoagriculturaloutlook/database-oecd-faoagriculturaloutlook.htm

Qiu H., Huang J., Keyzer M., van Veen W., Rozelle S., Fisher G., Ermolieva T. (2011), *Biofuel development, food security and the use of marginal land in China,* in "Journal of environmental quality", n. 40, pp. 1058-1067

Ravindranath N.H., Sita Lakshmi C., Ritumbra Manuvie, P. Balachandra P. (2011). *Biofuel production and implications for land use, food production and environment in India*, in "Energy policy", n. 39, pp. 5737–5745

REN21 (2008), *Renewables 2012 Global Status Report*, Paris: REN21 Secretariat and Washington, DC: Worldwatch Institute. Available at: http://www.ren21.net/default.aspx?tabid=5434

The Royal Society (2008), *Sustainable biofuels: prospects and challenges*. Policy document 01/08, January. London. Available at: http://royalsociety.org/policy/publications/2008/sustainable-biofuels/

Trostle R. (2008), *Global Agricultural Supply and Demand: Factors Contributing to the Recent Increase in Food Commodity Prices*, United States Department of Agricultural (USDA-ERS), WRS-0801, Washington, DC, may 2008. Available at: http://www.ers.usda.gov/publications/wrs-international-agriculture-and-trade-outlook/wrs-0801.aspx

ZEZZA A. (2008), (a cura di), *Bioenergie: quali opportunità per l'agricoltura italiana?*, Inea Studi & Ricerche - Esi, Napoli.

ZEZZA A. (2007), *Sostenibilità economica e ambientale della produzione dei biocarburanti*, in "QA Rivista dell'Associazione Rossi-Doria", n.4, pp. 49-80.

ANALYSIS OF THE RELATIONSHIP BETWEEN CHILD MALNUTRITION AND FOOD INSECURITY IN A RURAL AREA OF THE DEMOCRATIC REPUBLIC OF CONGO

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Abstract

According to the UNICEF's General Framework for Malnutrition, Household Food Security is one of the three underlying causes of maternal and child undernutrition. In order to verify whether this relation also applies in rural areas of the province of Central Kasai, in the Democratic Republic of Congo, we performed a cross-sectional study which included 300 randomly selected households of eight rural districts. The research revealed that child malnutrition – measured as wasting and stunting – was not correlated with Food Consumption Score (FCS).

1. Introduction

Child undernutrition is one of the major causes of mortality and morbidity throughout the world and is responsible every year for at least 3.1 million of child deaths (Victora et al., 2008). In fact, at least one third of total child deaths in the world are linked to malnutrition due to the increased risk of dying of malaria, measles and pneumonia. From a socio-economic perspective, malnutrition is correlated with limited life expectancy, disabilities, reduced workers' productivity and higher health-care costs (Frongillo, de Onis, & Hanson, 1997). Malnutrition has also a very high social and economic impact since it is responsible for the 6.7% of DALYs (Disability Adjusted Life Years) in the world (Lim et al., 2012).

This burden affects poor countries at a greater extent as almost 90% of undernourished children live in low-income and low-middle income countries (UNICEF, 2013).

The Democratic Republic of Congo is one of the poorest countries of the world. During the past two decades its development was halted by two civil wars which costed at least 3.4 million casualties, and left the country struggling in a deeply unstable political configuration, to this day.

Not surprisingly Child Malnutrition in the Democratic Republic of Congo is a serious health and socio-economic issue, with chronic and acute malnutrition rates standing respectively at 43 and 8% (WHO, 2015a). Compared to other regions

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constantly affected by civil wars, like the Great Lakes Region, Central Kasai has not been affected by war in the last 30 years; nonetheless, indicators regarding mother and child malnutrition are among the worst in the country. The under-five mortality rate in Central Kasai is of 135 children every 1,000 births, and the underweight prevalence stands at around 30% (USAID, 2014).

According to UNICEF General Framework for Malnutrition, there are three layers of causal determinants of child malnutrition – basic, underlying and immediate causes. The basic causes are those related to the political, economic, legal and ideological context since they determine the effective state of resources distribution and utilization in the population.

Among the underlying causes that directly influence the nutritional status at the household level there are food security, inadequate care, unhealthy households and poor health services.

Many authors have highlighted the clear relationship that links poor caring practices and poor hygienic environments to the onset of child malnutrition (Campbell, Benova, Gon, Afsana, & Cumming, 2015; Dangour, Watson, Cumming, Boisson, & Che, 2013; Ngure et al., 2014). However, the association between household food security and child undernutrition is still unclear, especially in rural Sub-Saharan regions where hunger hits poor households the most.

The aim of this paper is to verify the association between household food security (measured through the Food Consumption Score) and child malnutrition in a rural context in the Democratic Republic of Congo.

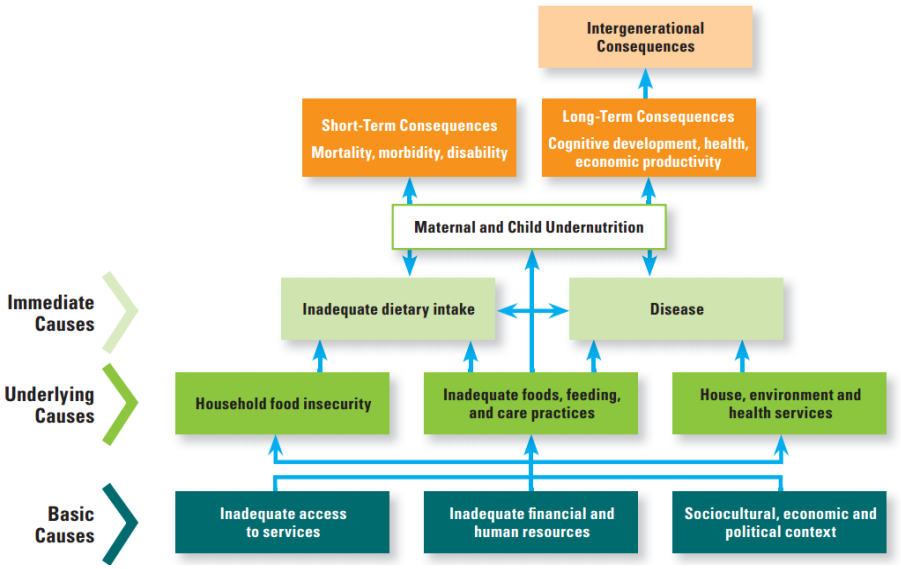

Figure 1: UNICEF General Framework for malnutrition

7. Material and Methods

7.1 Study area and population

The study was conducted in the region of Luiza, in the Central Kasai province.

Total population at the time of data collection was estimated at 174,000 people (Bureau Central de la Zone de Santé de Luiza, 2015).

7.2 Study design

This is a cross-sectional sub-study of a multi-sectorial project funded by the UNDP[23] and carried out by the INGO COOPI (Cooperazione Internazionale). The main objective of the research was to assess whether child malnutrition significantly correlated with poor food consumption patterns. Three hundred children aged between 6 and 59 months were anthropometrically measured and their household's responsible was asked to answer questions regarding food access, diet and consumption, as contemplated in the Food Consumption Score.

7.3 Sampling methodology and sample size

Following a three-steps sampling methodology, eight Health Districts (Zones de Santé - ZS) were selected as primary sampling units (total population estimated at 70,022 inhabitants); the eight areas selected were the most affected by child malnutrition according to a Screening survey conducted in the same region. Within the eight ZS, twenty-five clusters – 22 villages and 3 quarters of the small city of Luiza – were randomly selected as the sampling pool. Finally, following the criteria of selecting 12 households per cluster, 300 households were randomly included in the investigation,

Sample size calculation was based on results of the Screening survey on the prevalence of malnutrition in the target area, and estimates of under-five mortality rate from the demographic archives of the Health-Zone Central Office of Luiza (Bureau Centrale de la Zone de Santé). We estimated a design effect of 1.5 according to the "Sampling Methods and Sample Size Calculation for the SMART Methodology" that sets DEFF at 1.5 when expected prevalence is around 10% or no previous information about DEFF is available or the number of households per cluster is lower or equal to 15 (Humanitarian Response, 2012). Table 1 summarizes the sampling procedure.

Parameter	**Value**
Under-five children percentage	17.1%
Expected malnutrition prevalence[24]	11,9%
Desired precision (d)	5%
Design effect (DEFF)	1.5
Average household size	6
Percentage of non-response households	5%
Children to be included	263
Households to be included	300
Household per cluster	12
Number of clusters	25

Table 1: Sampling procedure

[23] UNITED NATIONS DEVELOPMENT PROGRAM
[24] Screening Survey conducted in August 2015

$$n = \left(t^2 \times \frac{p \times q}{d^2}\right) \times DEFF$$

Figure 2: Sample size calculation formula n = sample size ; t = linked to 95% confidence interval for cluster sampling; p = expected prevalence; q = 1-p ;d = relative desired precision ; DEFF = Design Effect (Action Contre la Faim International, 2012)

7.3.1 Sampling pool

The sampling pool was created from the list of villages and neighbourhoods of the eight ZS of the region of Luiza which resulted as malnutrition hot spots by a Screening Survey carried out during the month of August.

District	**Village**	**Pop.**	**Cluster**	**District**	**Village**	**Pop.**	**Cluster**
Mukungu	MUKUNGU	1732	1	Kamushilu	KANEMA	352	14
	ISUKU	376	2		NTUNGU	1741	15
	NGUEJANSANDJI	714	3		KAMUSHILU	1701	16
	KATANDA	516	4	Kakamba	KABUANKAMUTONGA	978	17
Mubinza	NTUMBA	1709	5		QUARTIER KANO	2692	18
	KABULUKU	1439	6		UPUTU	84	19
	MUYOWU	532	7	Kandakanda	QUARTIER KAKAMBA	2478	20
	MUKENGE	1518	8		LUYAMBI	3279	21
Mpikambuji	MPIKAMBUJI	1063	9		ILUNGA 2	2015	22
	KANTU	554	10	Kakala	NSAKANSAKA	1101	23
Kapanga	KAPANGA	1199	11		MULUNDA	805	24
	DIABA	772	12		NGUEJAMBUTA	924	25
	KANDEBA	277	13				

Table 2: List of randomly selected villages/neighbourhoods including total population according to

7.4 Indicators

7.4.1 Food Consumption Score (FCS)

The Food Consumption Score (FSC) is a reliable indicator of food security status of households, which focuses primarily on “food access”. The score is calculated by taking in consideration the frequency of consumption of several food groups (staple foods, animal-derived protein sources, milk, tubers, oils and fat, fruits, vegetables, pulses, spices, etc.), each one weighted with a different coefficient corresponding to its nutritional value.

FCS cut-offs and weights are summarized in table number 2 and 3.

Value	**Food Consumption Score**
0-28	Poor
29-41	Limit
>42	Acceptable

Table 3: FCS cut-offs

Food group	**Weight**
Cereals, tubers and root crops	2
Meat and fish	4
Milk	4
Oil/fats	0.5
Fruit	1
Vegetables	1
Pulses	3
Sugar	0.5

Table 4: FCS food groups and weights

7.4.2 Child malnutrition

Child malnutrition was measured using Weight-for-Height (acute malnutrition) and Height-for-Age (chronic malnutrition) Standard Deviations (Z-scores). A child whose Z-score is lower than -2.00 was considered malnourished (World Health Organization, 2009).

7.5 Data collection and analysis

Participant's privacy and dignity were maintained during visits and throughout the study period. Verbal informed consent was considered sufficient, as written signature was not culturally suitable. All data collected were kept confidential and questionnaires anonymous.

7.5.1 Measurements

Anthropometric measurements included weight, height and level of oedema. Height was measured to the nearest millimetre with a measuring board, and weight with a paediatric balance scale. Length and height cut-offs were 65 and 110 cm. Children less than 24 months of age (or up to 87 cm in height) were measured lying down while children aged 24–59 months (or 87 cm and above) were measured standing up. Oedema presence was determined by applying gentle thumb pressure for 3 seconds on the topside of each foot. The investigators were required to specify the level of oedema according to three degrees of severity (+, ++, +++). In case of oedema, the child was classified as severely malnourished (de Onis et al., 2012).

7.5.2 Data verification and cleaning

All data collection sheets were verified by the study supervisors and sent daily to the survey coordinator in order to eliminate/rectify errors and inconsistencies. Length/height measurements were also checked for consistency with inclusion criteria.

7.5.3 Sheets preparation

Two input masks for the Wash/Food Security data were prepared at the beginning of the survey using Epi Info software (version 6.04d). Nutritional data were entered in the Nutrisurvey.ena software. After the first data insertion, a second one was performed in order to compare the files and eventually correct any possible mismatch. Beforehand, the input masks were tested regarding internal and external consistency. All data were transferred to SPSS (version 20) to perform data cleaning and statistical analysis.

7.5.4 Statistical analyses

All analyses were conducted using SPSS (version 20). Proportions were compared using a Chi-Square Test with a significance level of 95% ($P < 0.05$), and correlations were tested using Pearson's r correlation coefficient. Food groups consumption were analysed across both FCS and malnutrition groups performing an Independent-Samples Kruskall-Wallis Test.

8. Results

8.1 Socio-demographic characteristics

Among the 286 surveyed households, agriculture was the main source of income with a prevalence of 78%, followed by small-scale trading (11.9%) and salaried employment (5.6%).

All twenty-five clusters were located in rural areas at least 50 km away from the nearest populated area (Luiza).

Included households			**Main source of income**		
Included	286	95,33%	Agriculture	223	78,00%
Excluded*	14	4,67%	Small-scale trade	34	11,90%
Child's sex			Salaried work	16	5,60%
Male	143	50,00%	Other	8	2,80%
Female	143	50,00%	Fishing	4	1,40%
Child's age			Herding	1	0,30%
6-23	100	35,00%			
24-59	186	65,00%			

Table 5: Socio-demographic characteristics of the sampled households

8.2 Child nutritional status and Food Consumption Score results

Male and female ratio was perfectly balanced with 143 boys and 143 girls. Sixty-five percent of children were between 24 and 59 months old and 35% of them were between 6 and 23 months old. Acute malnutrition prevalence was 21% while chronic malnutrition rate was 53.5%. Regarding food security, 46.5% of households had an Acceptable FCS, 42.7% had a Borderline FCS and 10.8% had a Poor FCS.

Weight-for-Height		
Severe Wasted	11	3,80%
Moderate Wasted	49	17,20%
Not Wasted	226	79,00%
Height-for-Age		
Severe Stunted	71	24,80%
Moderate Stunted	82	28,70%
Not Stunted	133	46,50%
Food Consumption Score		
Poor	31	10,80%
Limit	122	42,70%
Acceptable	133	46,50%

Table 6: Prevalence of malnutrition – wasting and stunting – and Food Consumption Score

* Height higher than 110cm or length lower than 65cm

8.3 Statistical analysis

8.3.1 Chi-Square Test

As outlined in table 7,8 and 9 the analyses evidence no significant differences regarding the prevalence of malnutrition among the households grouped into the three food security groups. The absence of correlation was also true when the analyses focused on different age groups – from 6 to 23 month and from 24 to 59 months.

FCS and Wasting Prevalence 6-23 months			**Weight-for-Height (Wasting)**		**Tot**	**FCS and Wasting Prevalence 24-59 months**			**Weight-for-Height (Wasting)**		**Tot**
			Wasted children	**Non-wasted children**					**Wasted children**	**Non-wasted children**	
FCS	Acceptable	counting	57	76	133	FCS	Acceptable	counting	32	101	133
		% in FCS	42,90%	57,10%	100%			% in FCS	24,10%	75,90%	100%
	Borderline	counting	50	72	122		Borderline	counting	21	101	122
		% in FCS	41,00%	59,00%	100%			% in FCS	17,20%	82,80%	100%
	Poor	counting	13	18	31		Poor	counting	9	22	31
		% in FCS	41,90%	58,10%	100%			% in FCS	29,00%	71,00%	100%
	Total	counting	120	166	286		Total	counting	62	224	286
		% in FCS	42,00%	58,00%	100%			% in FCS	21,70%	78,30%	100%

Table 7: Crosstab between FCS and Wasting

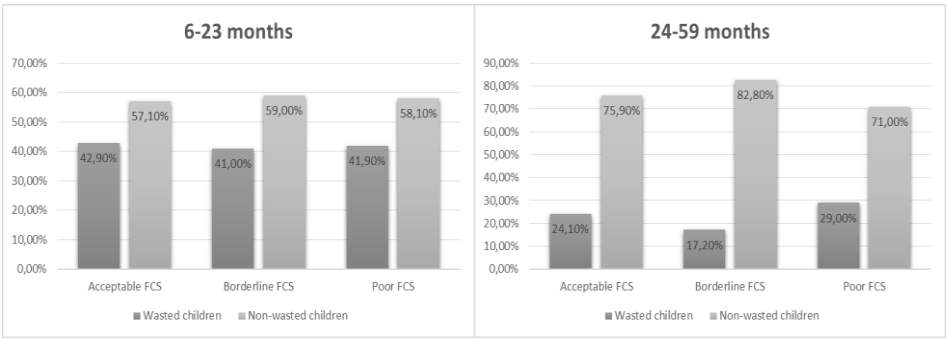

Figure 3: Wasting prevalence across FCS groups. No significative difference emerged among different FCS Groups (Acceptable, Borderline, Poor) regarding Wasting Prevalence

6-23 months				**24-59 months**				**TOTAL**	
Indicator	Value	df	Asymptotic Significance (2-sided)	Value	df	Asymptotic Significance (2-sided)	**TOTAL**	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	,575[b]	2	,750	1,782[c]	2	,410	Pearson Chi-Square	2	,490
Likelihood Ratio	,578	2	,749	1,794	2	,408	Likelihood Ratio	2	,491
Linear-by-Linear Association	,415	1	,519	,180	1	,671	Linear-by-Linear Association	1	,988
N of Valid Cases	100	b. 1 cells (16, 7%) have expected count less than 5. The minimum expected count is 4, 90.		186	c. 0 cells (0, 0%) have expected count less than 5. The minimum expected count is 7, 79.		N of Valid Cases	a. 0 cells (0, 0%) have expected count less than 5. The minimum expected count is 12, 79.	

Table 8: Statistical significativity between FCS and Wasting. Limit value for significance ≤ 0,05

FCS and Stunting Prevalence 6-23 months			Height-for-Age		Total	FCS and Stunting Prevalence 24-59 months			Height-for-Age		Total
			Stunted children	Non-stunted children					Stunted children	No n-stunted children	
CS F	Acceptable	counting	25	22	47	FCS	Acceptable	counting	47	39	86
		% in FCS	53,19%	46,81%	100%			% in FCS	54,65%	45,35%	100%
	Borderline	counting	20	23	43		Borderline	counting	45	34	79
		% in FCS	46,50%	53,50%	100%			% in FCS	56,96%	43,04%	100%
	poor	counting	6	4	10		poor	counting	10	11	21
		% in FCS	60,00%	40,00%	100%			% in FCS	47,62%	52,38%	100%
	Total	counting	51	49	100		Total	counting	102	84	186
		% in FCS	51,00%	49,00%	100%			% in FCS	54,84%	45,16%	100%

Table 9: Crosstab between FCS and Stunting

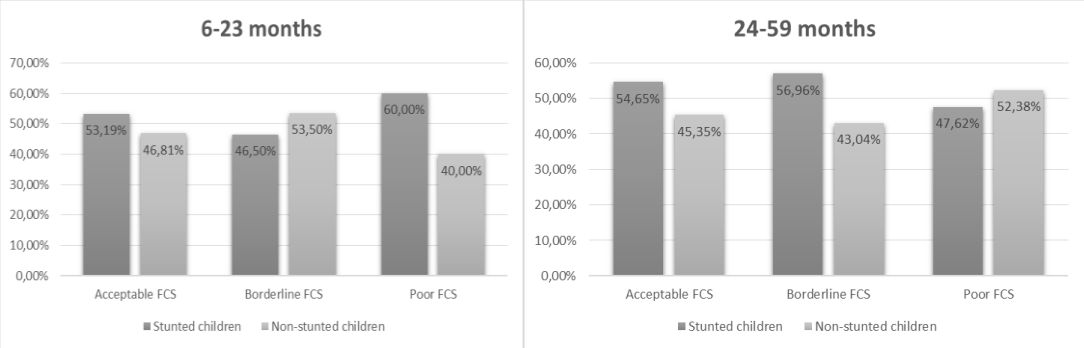

Figure 4: Stunting prevalence across FCS groups. No significative difference emerged among different FCS Groups (Acceptable, Borderline, Poor) regarding Wasting Prevalence

6-23 months				24-59 months			Total		
Indicator	Value	df	Asymptotic Significance (2-sided)	Value	df	Asymptotic Significance (2-sided)	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	,761[b]	2	0,683	,587[c]	2	0,746	,068[a]	2	0,966
Likelihood Ratio	0,764	2	0,683	0,585	2	0,746	0,068	2	0,966
Linear-by-Linear Association	0,002	1	0,969	0,087	1	0,767	0,065	1	0,800
N of Valid Cases	100	b. 1 cells (16,7%) have expected count less than 5. The minimum expected count is 4,90.		186	c. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 9,48.		286	a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 14,42	

Table 10: Statistical significativity between FCS and Stunting. Limit value for significance ≤ 0,05

8.3.2 Independent-Samples Kruskall-Wallis test

No differences were found when considering the average household consumption of single food groups among households with malnourished children and those with no malnourished children (see tables 10 and 11).

Household FCS	Children's nutritional status	Cereals	Pulses	Vegetables	Fruits	Meat/fish	Milk and dairy products	Sugar	Oils
ACCEPTABLE	Non-stunted children	6,99	4,20	6,79	3,07	3,37	1,28	2,24	6,76
	Stunted children	7,00	3,72	6,92	2,31	3,18	1,11	1,51	6,75
BORDERLINE	Non-stunted children	7,00	0,62	7,00	1,94	1,34	0,03	1,37	6,56
	Stunted children	7,00	0,95	6,91	2,02	1,26	0,02	1,23	6,18
POOR	Non-stunted children	7,00	0,00	7,00	1,47	0,06	0,00	0,88	6,41
	Stunted children	7,00	0,07	7,00	0,93	0,00	0,00	0,60	5,80
Equal distribution across the categories STUNTING – NON STUNTING		Yes 0,243	Yes 0,477	Yes 0,505	Yes 0,545	Yes 0,496	Yes 0,575	Yes 0,386	Yes 0,353
Equal distribution across the categories ACCEPTABLE, BORDERLINE, POOR		Yes 0,550	**No 0,000**	Yes 0,550	**No 0,044**	**No 0,000**	**No 0,000**	Yes 0,281	**No 0,004**

Table 21: Independent sample test for stunting and FCS. Average consumption per household is used in the food groups' columns

Household FCS	Children's nutritional status	Cereals	Pulses	Vegetables	Fruits	Meat/fish/	Milk and dairy products	Sugar	Oils
ACCEPTABLE	Non-Wasted Children	6,99	3,75	6,83	2,66	3,42	1,31	1,83	6,73
	Wasted Children	7,00	4,77	6,89	3,03	2,86	0,97	2,14	6,83
Borderline	Non-Wasted Children	7,00	0,77	6,95	1,99	1,33	0,03	1,23	6,43
	Wasted Children	7,00	0,78	7,00	1,96	1,22	0,00	1,61	6,30
Poor	Non-Wasted Children	7,00	0,05	7,00	1,00	0,05	0,00	0,68	5,73
	Wasted Children	7,00	0,00	7,00	1,70	0,00	0,00	0,90	7,00
Equal distribution across the categories WASTING – NON WASTING		Yes 0,372	Yes 0,617	Yes 0,274	Yes 0,154	Yes 0,308	Yes 0,915	Yes 0,430	Yes 0,141
Equal distribution across the categories ACCEPTABLE, BORDERLINE, POOR		Yes 0,550	**No 0,000**	Yes 0,550	**No 0,044**	**No 0,000**	**No 0,000**	Yes 0,281	**No 0,004**

Table 12: Independent sample test for wasting and FCS. Average consumption per household is used in the food groups' columns

9. Discussion

Rates of child malnutrition in this sample of households of the province of Central Kasai were found to be very high. According to the WHO cut-offs, wasting prevalence higher than 15% is considered "critical" (de Onis et al., 2012), and in our sample the prevalence was definitely above the cut-off percentage. The results are coherent with

the latest Demographic and Health Survey conducted in 2014 where malnutrition rates in Central Kasai were among the highest in the Democratic Republic of Congo (USAID, 2014).Besides malnutrition rates, the survey also highlighted other key development indicators which are poorly applied in Central Kasai, such as mosquito-nets utilization, presence of WASH facilities (covered latrines, protected sources of water) and public health access (USAID, 2014).

The absence of correlation between household food security and child malnutrition could be accounted for by other underlying variables, which, nonetheless can potentially influence results. Although poor households food security is among the three underlying causes of malnutrition, its association with child malnutrition is often blunted by coping strategies aimed to protect the youngest elements of the family (Leonard, 1991), so that FCS does not always reliably reflects a child nutrition status. Moreover, studies have also shown that FCS does not always appropriately reflects individual nutrient intakes levels, notably because of its universal food-weights that are hardly applicable in every context of analysis (Jones, Ngure, Pelto, & Young, 2013). For example, we found fruit consumption to be very low in all the three FCS subgroups – possibly hiding some chronic micronutrient deficiencies that could lead to malnutrition (Lock, Pomerleau, Causer, Altmann, & McKee, n.d.). In fact, FCS does not discriminate between which category of fruits and vegetables are being consumed – rich in Vitamin A, iron, folic acid – but it simply "counts" the household consumption frequency.

On the other hand, WASH environment (WHO, 2015b) and breastfeeding and/or complementary feeding practices (Setegn et al., 2012; WHO, 2009) have a more direct impact on child nutritional status, and, according to the 1,000 Days paradigm, the child's nutritional status is also significantly affected by the quality of feeding during the first 1,000 days of his life, which include the nine months spent in the mother's womb (Duggan, 2014). Further analyses are required to confirm the findings.

10. Study limitations

Our study sample – 300 households – was big enough to provide statistical significance, yet a higher number of households could be required to underline the cause-effect relation between malnutrition and household food security. The number of households included was within our logistic and financial means.

Another limitation was the utilization of self-reported date of birth in months referred by the household's caregiver as birth certificate was not always present at the moment of the interview.

11. Conclusion

Food Consumption Score alone was not able to provide sufficient correlation with both acute and chronic child malnutrition when applied in a rural context in the Democratic Republic of Congo (Kasai Central). Yet, average consumption for some food group categories was significantly different across Food Consumption Score

categories. Further researches are required, focusing on a qualitative and semi-qualitative approach throughout Focus Groups and KAP Surveys.

12. References

Action Contre la Faim International, (2012), Emergency Nutrition Assessment for Standardized Monitoring and Assessment of Relief and Transition (ENA for SMART), Retrieved from http://actioncontrelafaim.ca/program-areas/smart/

Bureau Central de la Zone de Santé de Luiza, (2015), *Données Démographiques 2015*, Luiza (Central Kasai, DRC)

Campbell, O. M. R., Benova, L., Gon, G., Afsana, K., & Cumming, O. (2015), Getting the basic rights - the role of water, sanitation and hygiene in maternal and reproductive health: a conceptual framework, *Tropical Medicine & International Health*, *20*(3), 252–267. http://doi.org/10.1111/tmi.12439

Dangour, A. D., Watson, L., Cumming, O., Boisson, S., & Che, Y. (2013), Interventions to improve water quality and supply, sanitation and hygiene practices, and their effects on the nutritional status of children, *The Cochrane Database of Systematic Reviews*, *8*. http://doi.org/10.1002/14651858.CD009382.pub2

de Onis, M., Onyango, A., Borghi, E., Siyam, A., Blössner, M., & Lutter, C. (2012), Worldwide implementation of the WHO Child Growth Standards, *Public Health Nutrition*, *15*(9), 1603–10. http://doi.org/10.1017/S136898001200105X

Duggan, M. B. (2014), Prevention of childhood malnutrition: immensity of the challenge and variety of strategies, *Paediatrics and International Child Health*, *34*(4), 271–8. http://doi.org/10.1179/2046905514Y.0000000139

Frongillo, E., de Onis, M., & Hanson, K. (1997), Socioeconomic and demographic factors are associated with worldwide patterns of stunting and wasting of children, *The Journal of Nutrition*, *127*(12), 2302–9. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/9405578

Humanitarian Response, (2012), Sampling Methods and Sample Size Calculation for the SMART Methodology, Retrieved from HumanitarianResponse.info

Jones, A., Ngure, F., Pelto, G., & Young, S. (2013), What are we assessing when we measure food security? A compendium and review of current metrics, *Adv Nutr*, *4*(5), 481–505. http://doi.org/10.3945/an.113.004119

Leonard, W. R. (1991), Household-level strategies for protecting children from seasonal food scarcity, *Social Science and Medicine*, *33*(10), 1127–1133. http://doi.org/10.1016/0277-9536(91)90228-5

Lim, S. S., Vos, T., Flaxman, A. D., Danaei, G., Shibuya, K., Adair-Rohani, H., … Memish, Z. A. (2012), A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*, *380*(9859), 2224–60. http://doi.org/10.1016/S0140-6736(12)61766-8

Lock, K., Pomerleau, J., Causer, L., Altmann, D. R., & McKee, M. (n.d.), The global burden of disease attributable to low consumption of fruit and vegetables: implications for the global strategy on diet, *Bulletin of the World Health*

Organization, *83*(2), 100–108. http://doi.org/10.1590/S0042-96862005000200010

Ngure, F. M., Reid, B. M., Humphrey, J. H., Mbuya, M. N., Pelto, G., & Stoltzfus, R. J. (2014), Water, sanitation, and hygiene (WASH), environmental enteropathy, nutrition, and early child development: making the links. *Annals of the New York Academy of Sciences*, *1308*(1), 118–128. http://doi.org/10.1111/nyas.12330

Setegn, T., Belachew, T., Gerbaba, M., Deribe, K., Deribew, A., & Biadgilign, S. (2012), Factors associated with exclusive breastfeeding practices among mothers in Goba district, south east Ethiopia: a cross-sectional study, *International Breastfeeding Journal*, *7*(1), 17. http://doi.org/10.1186/1746-4358-7-17

UNICEF, (2013), *Improving child nutrition. The achievable imperative for global progress*. http://doi.org/978-92-806-4686-3

USAID, (2014), Enquête démographique et de santé en république democratique du Congo, 668

Victora, C. G., Adair, L., Fall, C., Hallal, P. C., Martorell, R., Richter, L., & Sachdev, H. S. (2008), Maternal and child undernutrition: consequences for adult health and human capital, *The Lancet*, *371*(9609), 340–357. http://doi.org/10.1016/S0140-6736(07)61692-4

WHO, (2009), The importance of infant and young child feeding and recommended practices, World Health Organization. Retrieved from http://www.ncbi.nlm.nih.gov/books/NBK148967/

WHO, (2015a), *Democratic Republic of the Congo: WHO statistical profile*

WHO, (2015b), WHO | Improving nutrition outcomes with better water, sanitation and hygiene: *Practical Solutions for Policy and Programmes*, Retrieved from http://www.who.int/water_sanitation_health/publications/washandnutrition/en/

World Health Organization, U. N. C. F. (2009), *WHO child growth standards and the identification of severe acute malnutrition in infants and children* (Vol. 2012), Retrieved from http://www.who.int/nutrition/publications/severemalnutrition/9789241598163_eng.pdf

DOCUMENTI


GEOPROGRESS
ONLUS
Aula Magna at Rectorate of the University of Torino
Via Verdi 8 - Torino
1st GEOPROGRESS
GLOBAL FORUM
Food, geography and
security policies
Torino, 3-4 May 2016
Conference promoted by the GeoProgress Journal
Organised by
with the collaboration of
Financial contribution of
Compagnia di San Paolo
Under the Patronage of
REGIONE PIEMONTE
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From the 1st edition of

THE GEOPROGRESS GLOBAL FORUM

Proceedings of the International Conference

on

"FOOD, GEOGRAPHY AND SECURITY POLICIES"

held in Torino, at University, May, 3-4 2016

OPENING SESSION

THE GGF INITIATIVE AND THANKS

Well, since it is already half past 2 pm, we should get started.

Can I have your attention, please?

Good afternoon!

I welcome you all to this conference and thank you for coming.

My name is Francesco Adamo, responsible for this conference which is the main component, the core, of the Geoprogress Global Forum (GGF). In fact, this initiative will continue both with the publication of scientific papers and the development of the debate over the web.

Each edition of GGF focuses on a different problem or set of problems related to territory development, from local to global scale, debates policies, management models and action proposals, with the aim to contribute to humanity progress.

In the edition 2016, the first one, GGF intends to focus on food security issues. In particular, it aims:

- to analyze current food geography, which involves great differences in nutrition problems in different territories, requires different solutions and an overall re-launch of cooperation among people for a sustainable development;
- to discuss the strategies of food security and safety for humanity and put forward new policies and regulations, nationally and internationally.

Its purpose is not only to give continuity to the debate concerning the issues of EXPO and the Charter of Milan (2015) that should be constantly in the spotlight of scholars and public decision makers; but also to try to further involve the scientific community in the hunger problem and to contribute to define the modalities of "Feeding the Planet", that was the slogan of Expo 2015, and particularly how to feed it sustainably.

Opening the work of this conference, let me again thank you all for being here, and especially all the speakers and organizers mentioned in the brochure who have made possible its realization. Among these ones a particular praise goes to prof.sa Maria Giuseppina Lucia, Coordinator of the Executive Committee and to the members of the Conference Secretariat.

I must also thank:

- DIST (Interuniversity Department of Regional and Urban Studies and Planning) as a whole, for the collaboration offered to Geoprogress;
- Compagnia di San Paolo which has financially supported this initiative, proving to appreciate it and giving confidence to our little Association;
- University of Turin, The City of Turin and the Piedmont Region which have granted their patronage and some services;

and not least

- Companies such as: MacBun, Guido Gobino Chocolate and Caffè Costadoro which have paid homage of their excellent products.

In this session, before briefly introducing the work, it is my pleasure to leave the stage to:

- the "landlord", the Rector of the University of Turin, Professor Gianmaria Ajani, whom I thank for his presence and for hosting the GGF in this beautiful and important historical site of the Turin science,
- another one of our host, the Mayor of the City, dr. Piero Fassino, whom I thank and whose presence at this meeting confirms his high sensibility to international issues and particularly to problems that look of others while being of everyone,

and to read the message of:

- the President of the Piedmont Region, dr. Sergio Chiamparino, whose participation is appreciated by all the members of Geoprogress and for which we are grateful.

WELCOME ADDRESSES [25]

Mayor of the City of Turin, dr. Piero Fassino,

I thank Geoprogress ONLUS for the invitation. I would first like to highlight how the topic of this meeting is extremely strategic: food is a fundamental condition for the existence and the survival of each individual. It seems essential to consider the quantities and the quality of food resources, necessary to feed not only individuals, but communities, nations, continents and the entire world. Through this perspective, we are not solely going to deal with the issue of food, but with the future of our planet.

I think that the subject can be addressed under different points of view.

The first one refers to the relationship between world population and food, and its relative distribution. We are currently living in a period in which food production capabilities would be essentially able to satisfy the dietary requirements of the whole world; it is not about underproduction, but about distribution. Humans would actually be able to produce enough to feed world population, but part of it, in large areas is still hungry. The lack of a proper distribution does not depend on an organizational problem; in fact all the necessary means and technologies to the transfer of goods are already available.

As we can see, the issue is strictly connected to a series of contradictions that need to be faced, redefining the relationship between production, consumption and markets.

The second point of view is instead referred to the employment of natural resources. In the most critical areas of the world, hunger is arising from the impossibility to have

[25] The speeches of the guests reported in this section had been reviewed and adapted by the editors.

access to fundamental resources such as water. The issue is now deeply related to how the right to access to natural resources is managed and to the necessity to address investments, technologies and means toward a strategic direction.

The third and last point regards the authenticity and the origin of crops and goods. It is a topic that is increasingly gathering the interest of experts and communities; it is driven by associations such as Slow Food, engaged in valorizing, restoring space and strength to the authenticity of crops, lost during the last decades of the last century.

The UN agenda for the development, after the Millennium Goal strategy, is articulated in 17 key objectives, among which the points I summarized can be traced. As we can see, the topic has such a great relevance that is currently a priority of the international community, of institutions, of governments and obviously of the whole society. It is a subject to which this Forum is suitably devoted.

I thank you and I wish you good work!

Rector of the University of Turin, prof. Gianmaria Ajani

I cordially greet all the colleagues and thank them for their participation to this event, the first International Forum organized by Geoprogress ONLUS, which will be held in this room of the University of Turin.

The topic of this Forum had been properly selected as a continuation of EXPO2015 purpose. Food production and fight against hunger are actions that must be implemented following a scientific approach, useful to the formulation of proper policies on food and food safety.

It had been properly highlighted by the Mayor's speech, how deep is the link between food safety and the contrast between abundance (and waste) and the impossibility to have access to food resources. I would add another key point: how food safety issues are connected to the North/South division of the world.

The area of the world where production levels are higher than the actual needs, enjoy a degree of protection of the supply chain that is instead weak or absent, and far from being implemented in the poorest areas of the planet. The presence of rules and international standards does not imply a uniform and harmonized application around the world.

Nowadays, the role of chemistry and biogenetic research, applicable to food production, is subject to heated debates. The center of the issue is referred to the fact that nature itself is not capable to feed the world entire population without provisions arising from agricultural processes. Especially the modalities of this support to nature are currently the core object of the debate.

I would like to conclude addressing my best wishes to Geoprogress ONLUS for the success of its first International Forum. Finally, I express my satisfaction for the interdisciplinary approach of such an event, as University of Turin places in such an approach one of its success factors, aware that only under this perspective these topics can be properly addressed.

President of the Piedmont Region, dr. Sergio Chiamparino

I would first like to address to the organizers of Geoprogress Global Forum, through Professor Francesco Adamo, best wishes for the success of the event; we are pleased to award our patronage because of the commonality of our objectives.

The wish is that the forum will be a fruitful moment of dialogue and exchange of experiences between international experts, aimed at deepening the strategies applicable to food safety, local development, redistribution of resources, and at proposing concrete hints, essential to redefine policies and rules on an international perspective.

Local policies and extemporaneous initiatives are not enough. Data on food geographic distribution, hunger and availability of resources, impose an integrated view highlighting the existing differences among food related issues in different territories. This perspective should produce ad hoc solutions on a global dimension that entail new frameworks of international cooperation.

I wish to this congress of researchers 'good work'. In addition I would invite to create a network, to work under a problem-solving, pragmatic perspective, to start from small issues, such as the elimination of weak individuals' daily humiliations, to the application of new technological solutions on water, to renewable energies, to agriculture. These are certainties for us, but are huge changes for disadvantaged communities, necessary to ensure their own future.

I wish you good work to contribute to the process of building a better world!

FROM EXPO 2015 OF MILAN TO THE GGF OF TURIN 2016 ON FOOD SECURITY

The interpretation of the world food security issues consistent with the vision of Geoprogress and mine will be understood it very soon in an introductory speech that points out some assumptions and concepts.

Now, I will only dwell once again on the aims of Geoprogress Global Forum and then point out the reason for a further initiative - after the EXPO 2015 and other initiatives - in which FOOD continues to be a leader.

With this conference, and also opening a debate through social networks, Geoprogress wants:

(1) to focus its attention on the real problems of "Feeding the Planet", the Expo slogan: on issues of world hunger and how to ensure food security for everyone, anywhere in the world. In short, the first aim is to shift attention from the delights and excellent foods (enhanced by the Expo) to how to achieve and give access to all humankind to adequate and healthy food without compromising the ecological conditions of life and production;

(2) greater involvement of the international scientific community in deepening the analysis of internal and external factors of underdevelopment and hunger in different countries, in the technical and political debate on food safety and related policies, domestic and international, and therefore necessarily in the research of new models and development policies at the local and global levels, allowing progressively to overcome the main socio-economic and ecological contradictions;

(3) to raise public awareness on the need to find new ways of development and urge movements and political parties in this research, which seems to have stopped, despite the cessation of the "communist threat," which instead should stimulate such research;

(4) to emphasize the importance of aid and international development cooperation, programs of international organizations (such as FAO, WFP, IFAD ..) and voluntary organizations, highlighting the positive results of their actions in the struggle against underdevelopment and hunger, rather than continue to "cry" on the many problems of the poorest countries, as they seem to do reports of certain international organizations. Cries and complaints do not increase by the public contribution and the one of private citizens of developed countries: in fact, if from the actions of solidarity does not derive positive results, why people from rich countries should donate money to support development projects in poor countries?

It is then true that the cooperation and development policies can and need to change, but it is another matter - which should also be widely discussed, highlighting however how to change.

(5) to highlight that natural, scientific and technical conditions to achieve the goal of zero hunger (and meet the needs of a world population which by mid-century will touch the maximum estimated of 9 billions) are existing, but the goal requires the will of States and their people, requires that the population of rich countries increase their awareness of the ecological and political risks of the current model of development and want to undertake with courage the path of sustainable development.

INTRODUCTION

THE GOAL ZERO HUNGER, A MUST

Francesco Adamo[26]

Abstract

This paper introduces some of the main world issues on food security and highlights the primary obstacles to be faced in order to reach the zero hunger objective. It starts from a brief overview on hunger geography, built on FAO's publications and data, pointing at highlighting that the current 800 million of hungry people are not depending on underproduction issues but on unequal distribution. It points out that possible future issues on food safety should not be attributed neither to world demographic growth nor to the incapability of the planet resources to feed 9.1 billion of people, but to the current soil and natural environment degradation processes, to poorly sustainable agriculture, to the distorted structure and the instability of markets.

1. Overview of the state and of the dynamic of world food insecurity

12.1 *What is hunger?*

Food malaise or food insecurity arises, as it is known, from:

1) undernourishment or overfeeding, so from shortage or excess of food in quantitative terms, to be considered primarily as a source of "life energy", quantified in calories:

2*)* malnutrition, intended as deficiencies of food in terms of quality due to shortcomings of some nutritious elements (or due to excesses) in the composition of the diet – for example of proteins, vitamins and various kinds of salt – and even due to healthiness conditions of consumed foods that can be unsanitary, contaminated.

These are two often connected forms of insecurity, particularly evident in underdeveloped and hungry regions. It is especially about these regions issues, and in general about the hungry portion of population – that consumes a daily quantity of food lower than the minimum necessary for an healthy life – that here I will deal with, for two reasons.

Overfeeding brings deeply different problems and asks for largely different solutions. In addition, the concern for this food insecurity, despite growing, is incomparably lower than that for underfeeding, which is the most serious form of feeding malaise and insecurity, considered by FAO as chronic hunger. Underfeeding increases the concern for the mass of people that are suffering from this condition, and that are probably going to increase in the future, if the fight against hunger is not strengthen and implemented through new strategies.

Providing an overview of hunger geography can be essentially useful for this purpose. We can merely point out which are the mostly hit countries, basing on FAO's

[26] Emeritus Professor of Economic and Political Geography, President of Geoprogress (Npo)

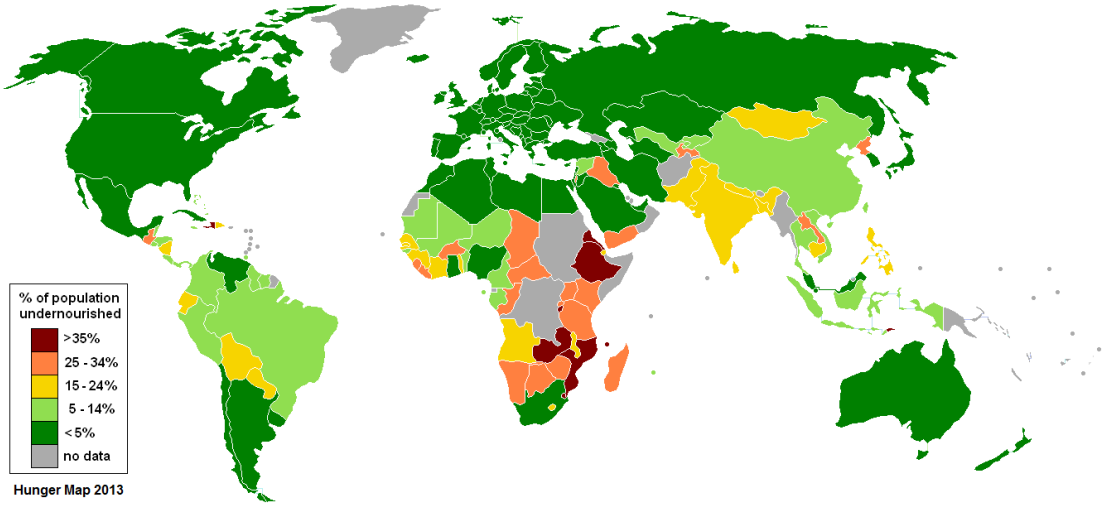
estimates, which is the only available source, and consequently assuming this UN agency hunger concept.

Referring to hunger geography, it is necessary to recall that different types of hunger are existing and they tend to involve different regions. The distinction is fundamental to deepen the subnational analysis and consequently define operational strategies. In this regard, we have to mention Josué de Castro's contribution, a Brazilian researcher who had a deep knowledge of his country and his works constituted a model for various successive studies. In his masterful "Geografia da fome" (1946) he introduced the following concepts: 1) food area, as a homogeneous region relating to specific diets; 2) endemic hunger area, as a food area in which at least 50% of population is subject to permanent nutritional deficiency manifestation (for example peasants landless, that survive working in latifundiums typical of plantation agriculture, inhabitants of traditional subsistence economy regions); 3) epidemic hunger area: area where at least 50% of population is subject to transitory nutritional deficiency (for example area subject to periods of droughts, floods, etc.)

On a subnational scale, the analysis of hunger nature and of its causes are essential and are consequently precisely implemented – by FAO, as by other international, national and subnational organs – to carry out local development projects and to defeat hunger.

1.2. World undernourishment and poverty

In order to measure the degree of the phenomenon and its relative geographic distribution, on a global scale – so orienting international policies – FAO' estimates of malnutrition by country, are doubtless useful. They are the only available, continuously published. For this reason these data are most used and the ones I will report here, even if, it is necessary to highlight that the results of hunger geographic distribution arising from such estimates are not dissimilar or more useful than those of poverty which are based on per capita income (with the same purchasing power). In particular, the countries most affected by hunger coincide with those where poverty is absolute, defining such the countries where at least 50% of inhabitants has an income lower than 1,25$ a day (line raised at 1,9$ by World Bank on October 2015) and broadly also with relative poverty countries, defined as such those where at least 50% of population has an income lower than 2,0$ a day.



The spatial correlation between poverty and hunger points out that the fight against hunger is one with the fight against poverty and underdevelopment, and it does not require, as we will see, just a food production level growth.

The struggle against poverty and hunger is an inevitable objective, not only on a human fraternity and solidarity perspective, but also considering the more general effects of hunger on health and on work productivity. These are highlighted by the strong spatial connection between chronic malnourishment and high morbility (consequence demonstrated by a multiplicity of medicine studies and due both to hunger-specific diseases and others diseases to which a debilitated body, because of hunger, is more subject), high mortality (child and general) and low work productivity.

Against this struggle is impossible to give up and to face world economic crisis and increasing national and egoistic closures is necessary that the democratic political forces and the international scientific community commit themselves more vigorously.

1.3. Tendencies and conditions of progress in the fight against hunger.

The number of undernourished people in the world is estimated at 795 millions of individuals, one over nine: it is still a huge amount, as mentioned. Nevertheless, this number has decreased of 167 millions of units in the last di decade, and of 216 million in respect of the period 1990-92. About 780 millions of hungry people, the largest majority, live in underdeveloped countries, where in general, the underfeeding index has fallen of 44,4% in respect of the period 1990-92, and nowadays underfeeding involve the 12,9% of the population (FAO, IFAD, WFP, 2015) [27].

Underdeveloped countries, as a general tendency, have reached the hunger reduction objective set for the year 2015 by the "Millennium Development Goal (MDG), while they largely missed the goal set for the same year by the "World Food Summit" (WFS)

[27] The number of underfeed people per country is estimated through complex statistical computations, starting from a prevalence index of underfeeding that assess the probability that a randomly selected individual, within a certain population, consumes fewer calories than the necessary ones for an healthy and active life. The computation that starts from per capita calories consumption (food production, plus imports, minus exports, divided for current population) should consider demographic differences and socio-economic inequalities.

of Roma (1996). Wide differences have been recorded concerning the progresses toward those targets (see http://www.fao.org/3/a-i4674e.pdf):

- Latin America (except Caribbean) and Eastern and South-eastern Asia have registered large progresses and succeeded in reaching also the more ambitious WFS objective;
- Caucasian and central Asia, Northern and Western Africa reached only the MDG;
- Caribbean, Oceania, Southern Asia, Eastern and Southern Africa registered some progresses but did not reached the MDS;
- Central Africa and Western Asia reached worse positions, registering even worse percentage of underfeed people in respect of the period 1990-92.

Considering some of the common features of the countries that showed the largest improvements in the last 25 years, it is clear that the main conditions for progress rely on the political stability and on an economic growth supported by healthy social protection policies (toward more vulnerable groups of inhabitants).

In addition, it is necessary to highlight that the success in reducing the number of undernourished people have certainly been obtained, as mentioned in FAO's statement, despite of a rapid growth of the population, the volatility of raw materials prices (that for many of those countries represent a key economic base), the high prices of food and energy, the growing unemployment and the recession occurred at the end of 1990 decade and again in 2008. It is also necessary to point out that the global reduction is mainly due to poverty alleviation and lowered level of food insecurity in some large and highly populated countries.

According to FAO's interpretation, and confirmed by many studies and experiences, additional important cues have been highlighted by the results of the last 25 years:

- "In the short run, the only means to address food insecurity is humanitarian intervention.
- In the medium and the long term, hunger eradication can only be pursued if all stakeholders contribute to designing and enacting policies for improving economic opportunities, the protection of vulnerable groups and disaster preparedness. Action undertaken at the global and regional levels should take into account country specificities and exposure to natural and human-induced disasters, especially those of small island developing states." (FAO, IFAD, WFP, 2015)

2. Zero hunger goal: obstacles and policies.

Around 2050 it is forecasted that the Earth will reach the maximum level of population, that, according to ONU's estimates, will be close to 9,1 billion of people. Reducing to zero the hunger of the current 0,8 billion of hungry individuals and satisfying the food necessities related to the rise of the planet inhabitants in respect of the current (2015) 7 billion will require a food consumption growth of at least 50%. It is also necessary to consider the increase of demand for a richer diet, necessary to

overcome malnutrition, affecting also regions where underfeeding problems had been eliminated.

Will food production be able to increase to such an extent? If yes, through which policies it will be possible to reach the zero hunger goal? These are the questions that should be addressed and constitute the fundamental world food issue.

2.1. Fundamental issues: demographic growth and food production increase..

Against catastrophic interpretations of the global food issue, I need to highlight that:

1) Eventual future insecurity problems are neither due to demographic growth nor to an insufficiency of resources.

2) The current 800 million of hungry individuals are not a consequence of an insufficient food production but of an unequal distribution and of food wastes.

The demographic issue.

Our planet counted 2,8 billion of inhabitants in 1950. In 37 years, between 1950 and 1987, the population doubled. This sharp rise slowed down: fertility has halved since 1972, from 6 children per woman to the current 2,9. If the world population will continue grow with the current trend, it will touch its maximum point in 2050 – or even sooner – and then it will start decreasing.

The depopulation phenomenon is already taking place, as known, in many countries, rich and poor, such as Germany, Japan, China, Mexico ... and Italy, where the birth rate is decreased, becoming lower that the substitution rate of 2,1 per woman, as a consequence of the standard of living improvement. As the World Bank would say *"Economic and social development is the best contraceptive"*.

During the second half of the XXI century, the problem will become the depopulation, if starting from now it is not promoted an adaptation of production to the demographic aging, that in some countries is already a problem.

Paying attention to the spatial distribution of peasantry and potential farmland, it will certainly be necessary to face the already clear problem of peasants' migrations, in order to rebalance their relationship with the land: to convince both those who leave their land and those who welcome them.

Natural resources for food production issue.

Is the planet's usable land worth supporting the demographic growth and the related increase in food production? A pedo-geographer would answer that it is more than enough[28], especially considering the various lands in which it is possible to increase food productivity thanks to small adjustments.

[28] *The state of the world's land and water resources* Food and Agriculture Organization of the United Nations http://www.fao.org/nr/solaw/solaw-home/en/

Some data on agricultural production:

- Arable lands expansion between 1960 and 2010: 12%
- Increase of agricultural productivity for the same period: 150-200%
- Total arable land extension (pluvial agric. + irrigated agric.) in 1961: 1,4 billion of ha

The land area of our planet (about 15 billion of hectares) is covered for about 4 billion of ha by forests and for almost 5 billion of ha, that is one third of the overall land area, by agricultural productions (cultivation and grazing). Only one third of this agricultural area is cultivated, about 1,6 billion (including 20% of marginal lands), the remaining is employed as grazing.

The world total arable area has been determined by FAO as 4,4 billion of ha, just under three times the current cultivated area.

This global availability, here roughly computed, cannot make us forget neither the soils geography and their continual degradation, issues that demands for effective actions, nor the probable effects of climate change that require agricultural productions adaptation.

Two billion of hectares, almost the 25% of the 9 billion of hectares covered by agricultural productions and forests (4 billion), are subject to humans' related degradation, especially in regions such as Asia and Africa: damaged soils because of run-off erosion, of wind related effects, of compaction caused by excessively heavy

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• Total arable land extension (pluvial agric. + irrigated agric.) in 2006: 1,5 billion of ha
• Irrigated agriculture cultivated surface in 1961: 139 billion of ha
• Irrigated agriculture cultivated surface in 2006: 301 billion of ha
• Average number of hectares of cultivated land necessary to feed a person in 1961: 0,45 ha
• Average number of hectares of cultivated land necessary to feed a person in 2006: 0,22 ha
• Global arable land surface: 4,4 billion of ha
• Global cultivated surface employed for pluvial agriculture: 80% (1,2 billion of ha)
• Total surface currently cultivated: 1,6 billion of ha, of which 20% (0,3 billion of ha) on lands partially adapted for agriculture
• Global surface of land subject to degradation: 25%
• Global surface of land moderately subject to degradation: 8%
• Global surface of land subject to recovery: 10%
• In many regions, issues related to soil quality affect more than half of cultivated areas, especially in Sub-saharian Africa, South America, South-Eastern Asia and Northern Europe
• Total water resources took from aquifers, waterways and lakes for agricultural use: 70%
• Global agricultural output obtained through pluvial agricultural systems: 60%
• Degree to which irrigation improve agricultural productivity: double
•Volume of cereal crops from pluvial agriculture in developing countries (on average): 1,5 T
• Volume of cereal crops from irrigated agriculture in developing countries (on average): 3,3 t/ha
• Average number of crops per year from pluvial agriculture in Asia: 1
•Average number of crops per year from irrigated agriculture in Asia: 2
• World population that currently lives in water poor regions: 40%
• Number of countries that annually employ, for irrigation, more than 40% (critical threshold) of their water resources: 11
• Number of countries that annually take 20% of their water resources (threshold that imply a serious pressure and risk of water scarcity for the future): 8
• Renewable water resources currently consumed in Libya, Saudi Arabia, Yemen and Egypt: 100%+
• Renewable water resources currently consumed in South America: 1%
• Global arable located in low income countries: 22%
• Per capita cultivated syrface in low income countries: 0,17 ha; in medium income: 0,23 ha; in high income: 0,37 ha
• The availability of cultivated land per capita in low income countries is less than half the one of high income countries and the adequacy of arable land is generally lower.
• Per capita cultivated surface in high income countries as group (0,37 ha) is double than the one in medium income nations (0,23 ha) and that of low income ones (0,17 ha).

agricultural machine, of overgrazing, of mining and industrial pollution and of urbanization.

Being aware that this 25% is composed by 8% of degradation moderately subject lands and by 10% of lands subject to recovering, while only 7% is at high risk, should be consoling. Unfortunately this situation does not totally eliminate the problem, which is instead of wide amplitude, touching 50% of soils in some regions.

The ways to guarantee, in ecological and sustainable terms, the production of an amount of food able to feed more than the 9 billion of people predicted as maximum level of population, refers essentially to the rehabilitation of degraded lands and the increase in productivity, but also to the expansion of aquaculture.

If soils degrade faster and more than how they naturally regenerate, before discussing about this challenge and about the agricultural production sustainable growth (whose demand is constantly rising), it is necessary to highlight the aquaculture great potential; in particular the production and reproduction of food in marine waters (not in fresh waters), whose products are a more acceptable alternative (at least for Western's tastes) and ecologically more credible in respect of insects.

Moreover, as Daniel Nahon (2008) pointed out, there exist remedies to soil degradation to such an extent that, from the point of view of the agricultural economy geographer, the lands necessary to the food production growth are already sufficient, without the need to affect the forest heritage.

Finally, there exist vast regions in which are still employed traditional techniques with minimal agricultural yields. These are so low that a few, sustainable innovations would gradually but largely increase the level of output and at the same time stop the arable field expansion toward marginal lands and boost the reforestation process.

This objective, as that of avoiding affecting forests or that of stopping the expansion of degraded soils, requires an overall reduction of wastes. From the speculative plantation agriculture for products destined to the world market, thanks to the adoption of innovations devoted to reducing wastes as well as increasing productivity; to the more recent bio combustibles production agriculture, that from a certain perspective should be discouraged as it needs the use of extensive areas and shows a low ratio between the combustible energy and the relative amount necessary to produce it.

The removal of the obstacles through the previously cited ways, identified in order to increase the sustainability of food production and to transform the final zero hunger goal, "for everyone", from dream to reality, require multiple innovations in the related fields. From the production techniques to the organizations of the interventions, it is necessary to support the whole process with social innovations and the consequent reaffirmation of the primacy of politics, as it is at the various scales of social systems that the major obstacles are embedded.

2.2. United Nations and other entities lessons and those arising from the history of development of underdevelopment.

On some essential policies that should be implemented, and especially on methods and techniques of intervention in poor countries, it is possible to follow the lessons that arise from the 25 years of FAO's experience, already briefly analyzed; in addition we

can look at the experiences of other organs of the United Nations, of some state agencies and of some NGOs specifically invited to this conference and engaged in the fight against hunger and the local development of poor countries (v. FAO, IFAD, WFP, 2015).

It is seems useful, as a proper introduction of the debate, to highlight some of the main social obstacles that such policies are ignoring and that I think, should be necessary to remove, to reach the zero hunger goal.

In this respect, I will not dwell on events and processes of the global system that mainly constitute the causes of underdevelopment (such as colonialism and imperialism, and during the last seventy years: neo-imperialism, globalization and exchange liberalization) and that are certainly essential to understand the current geographic distribution of hunger. It is about, more or less remote, but known, facts (Adamo, 2006), that are impossible to eliminate. I consider at least useful to recall them, in order to commit ourselves to eliminate the effects that still survive and obstacle progress policies. Recalling the historical development of underdevelopment is especially useful to try to overcome, internal and international, unequal and unfair social relationships, that form the hearth of underdevelopment and to which depend poverty and hunger; it is also necessary in order to avoid that those relationships, still present in many countries, reproduce themselves as already happened in history.

The breakup of the balances between population and resources during colonialism and imperialism, had been worsen, after WW2, by the breaking of the balance between births and deaths, and lastly by the establishment of neo-imperialism, for which the 'food weapon' had been a key instrument.

This weapon, even more powerful than the atomic bomb, was held by the "wheat merchants" and lead by the US policy in support of its exports (launched since 1954, with federal law 480). In some poor countries, food farming has also had even worse negative effects from the policy, associated with the former, of the "gifts" of food surpluses to the "free world". And in some regions, even food aid (from Western countries), although essential to addressing emergency situations, has produced long-lasting adverse effects. Food agriculture and food security have been more generally compromised by trade liberalization than not only will continue to benefit the rich countries, but will also have negative effects on poor countries. Consider, for example, the spread of powdered milk (more expensive and less nutritious than breast milk) and Nestlé plants, which have transformed and monopolized agriculture in entire regions; or the spread of extensive breeding farms to provide low-cost hot dog and burger meat for McDonald and similar fast-food companies (at the expense of forests and even grassland crops, reduced to pastures in central and southern America).

Food farming aimed at meeting local needs was further penalized by the tremendous growth of the foreign debts of many countries that took place in the early 1980s and determined by the sudden, large rise of US interest rates. The debts growth bit especially underdeveloped countries that got indebted (when it was convenient because of the international inflation and the low US interest rates) especially to finance their industrialization process and the exports of more industrialized countries. The foreign debt and the IMF's constraints on the debt restructuring forced such countries, as evident in major emerging countries such as Mexico, Brazil, Argentina and others of the same macro region and of Africa, to export at any cost and consequently to a continuous deforestation or to an expansion of lower intensive productions. Among the IMF's

impositions on the restructuring of foreign debt, a clear liberal inspiration for the benefit of rich countries, in 1995 it also added that of ceasing to sustain local agriculture, not much profitable, and instead specializing on tropical plantation products (sugar, cocoa, coffee, soy, peanut...), on non-food products such as cotton demanded by medium-high classes (for example biofuel to fuel car engines).

It is just in this kind of things, that I reported as examples, and especially in social relationships and policies that made them possible, that we can assess the worsening of hunger and of natural environment degradation until the 1990s, and for many countries even later.

2.3. Affirming the primacy of politics toward insecurity and market instability.

A constant factor of food insecurity until nowadays, that constitutes one of the most difficult obstacles to overcome relies on the structure of the global market. This is particularly evident considering cereals, whose market[29], as known, is characterized by a strong geographical and economical concentration of supply, such that a few companies control the whole market and exercise the power of increasing prices, autonomously or politically motivated
Such a rise would appear irrelevant in high income countries, but in low income ones it can even cause hunger and those "bread-reels" that seemed to us to be of old times, and also other consequences due to initiatives of countries (such as China) that are acting to guarantee their own future food safety in response to market instability.

"For Americans, who spend less than one-tenth of their income in the supermarket, the soaring food prices we've seen so far this year are an annoyance, not a calamity. But for the planet's poorest 2 billion people, who spend 50 to 70 percent of their income on food, these soaring prices may mean going from two meals a day to one". Written by Lester R. Brown in 2011, in a context in which are certainly clear the risks of the new food geopolitics, 'new' as based on a different pricing situation: of scarcity, rather than of abundance. This is a situation similar to when international prices were lower than the US internal ones and the Federal Government were sustaining exports, offsetting the gap, and promoting the increase in demand of countries with different eating habits. The American abundance made possible to face serious famines that, before the Green Revolution, took place in India, or crop losses in Russia.

Despite the green revolution, in the new context the risks did not lessen, but increased
In fact, the same companies that control the prices of cereals control even those of feed for farms without land, widely diffused during the postwar period; these firms control

[29] World trade in cereals, feed and largely also of seed oils is substantially controlled by Five Big companies:

ADM -Archer Daniels Midland : US- based corporation, operating in 75 countries. Runs 265 processing plants; **Bunge** : founded in the Netherlands in 1818, new with its headquarters in New York state. operates in 40 countries, processing oilseeds, wheat, corn and sugar cane;

Cargill: based in the United States, a 150 year-old company employing 150,000 people in 70 countries. Distributes grain and oilseeds;

Glencore International (Anglo-Swiss multinational has about one-tenth of the grain market. Also distributes oilseeds and sugar),

Louis Dreyfus (French company founded in 1851, now operates in more than 50 countries).

the sale of seeds, fertilizers, fungicides and related products, on which food safety[30] also depends.

"More alarming still, the world is losing its ability to soften the effect of shortages. In response to previous price surges, the United States, the world's largest grain producer, was effectively able to steer the world away from potential catastrophe. From the mid-20th century until 1995, the United States had either grain surpluses or idle cropland that could be planted to rescue countries in trouble"(Brown, 2011).

2.3. Affirming the primacy of politics.

Countries' governments and political forces should effectively intervene on the regulation and restructuring of markets, and in general on unequal and unfair internal and international social relationships, through ways and forms that are still to be defined. No one has a ready recipe describing how governments and political-social forces will have to intervene in sustainable and right manner in absolute terms.

However, we can and we must continue to look for new methodologies, forms of governments and tools to implement the needed changes in social relationships and in ecological solutions needed to eradicate hunger and other related shortages.

FAO, various agencies, international programs and many NGO's commitment, mainly sustained by state funds, is undoubtedly praiseworthy – and all those still believing in "zero hunger goal" utopia and willing to fight for a sustainable and fair world, should address their support to hunger reduction programs promoted by those organs.

However, such commitment is insufficient if not followed by the reaffirmation of politics primacy and consequently the role each State to govern its own territory and contribute to govern the international socio-economic system, exercising such duties in the interests of populations and peace.

On the internal perspective, the State should serve and ensure the social order (guaranteeing a decent lives, ensuring freedoms and safeties, including the food one) and a "sustainable" development (ecologically, economically and socio-culturally): in other terms, an "alternative" development in respect of the current one. The processes in place in many societies, including those of many Western countries, continue their development toward the further increase of wealth concentration, of social disparities and of ecological imbalances. In the meanwhile politics seems unable and unwilling – although the public expenses devoted to remedy to the ecological effects of firms and families and to the social effects of economic organizations – to lead the firms' system and to regulate the economy.

On the international perspective, it is necessary that States, with the support of their citizens, act to achieve a fundamental objective: a new political and economic order

[30] The Big Six in the market of seeds and chemicals products for agriculture are **Sygenta, Bayer, Basf, Dow, Monsanto, DuPont.** Since the 90s have absorbed more than 200 companies and their patents. Today they have 77% of the "crop protection" market: agro-pharmaceuticals, fertilizers, insect antagonists; and 61% of the production of seed and GMOs (banned in Italy) and from genetic crosses (allowed).

It was announced (La Repubblica, February 2, 2016) the function between ChemChina-Syngenta will be one of the two supergiant oligopolists.

with the aims of ensuring political and economic stability to support a more sustainable development, of winning poverty and hunger, of intensifying development cooperation. Such a new order implies the reorganization of the existing institutions and the creation of multipolar governmental organs capable of effective decision-making and fact acting.

On both perspectives, ultimately, the fundamental problem is the realization of a fairer relation between national and international institutions and the market, especially with economic organizations, starting from credit institutions. The problem is not merely related to the definition of rules - that imply the avoidance of speculations, parasitic ransoms, dominance and exploitation positions - and to enforce them. It is crucial that State, so the international community, has the necessary tools to intervene and address the economy toward the satisfaction of general interests. To this regard it is relevant the presence and the work of social firms (of various genres), but also in strategic sectors the development of public-owned companies, which can be managed (willingly) with efficiency equal to that of private companies (and even higher, since they use public money).

Concerning methods and technical tools of governments, it is useful to highlight, referring to food development, the effectiveness in the adoption on the integrated approach promoted by the best research centers looking for positive and ecological solutions to food issues. It Italy it is for example the ENEA's case, that recognize "the possibility to tackle the issue through an integrated system based on a finite number of subsystems (agriculture, environment, food safety, water, health, energy, infrastructure, economy, etc.), to be managed in a coordinated manner, to face challenges ..." in pursuit of a sustainable production.

Such an integrated approach can only be operational if we overcome the (ideological) opposition between two only seemingly irreconcilable theses:

1) The one of the promoter of modern conventional agriculture, referring to how mechanization, irrigation, fertilizers and genetic improvements can effectively boost agricultural yields to contribute to demand satisfaction. And they are right!

2) The one of the promoter of local and biological agriculture. They retype that small farmers, all over the world, could enhance yields and be able to overcome poverty, employing techniques to improve fertility and avoiding synthetic fertilizers and pesticides. They are right too!
The integrated approach, to be implemented, requires facing anti-environmentalist variants of the two theses: the one of chemistry and growth apologist and that of traditional agriculture apologist, typical of each culture.

The desirable integration of ecologically better and more productive technologies can be more dynamically pursued and best achievable through the implementation plan for food production. It should be achieved thanks to the execution of territorial developments plan: a planning process that is systemic and consequently integrates its various sides looking at determined objectives.
Such a planning could lead to fully achieve the sustainability goals only if intended as continuous process and supported by constant monitoring, executed with the participation of local communities.

4. References

Adamo IEF"A world eco-fund for the regulation of the international environmental system", in United Nations Workshop on *Creative Financing for Environmentally Sound Technologies*, Belèm do Parà (Brazil) 2nd-7th December 1990, New York, United Nations Centre for Science and Technology for Development (UNCSTD), Document 21, Group F

Adamo F. (2006), "Sviluppo e sottosviluppo nell'era del globalismo", in D. Lombardi (ed.) , *Percorsi di geografia sociale*, Bologna, Patron, pp. 165-192

Brown L. R. (2011), *The New Geopolitics of Food - From the Middle East to Madagascar, high prices are spawning land grabs and ousting dictators. Welcome to the 21st-century food wars*, FP, May/June 2011, in http://foreignpolicy.com/2011/04/25/the-new-geopolitics-of-food/

FAO, IFAD and WFP (2015), *The State of Food Insecurity in the World 2015.* Meeting the 2015 international hunger targets: taking stock of uneven progress. Rome, FAO.

FAO and ITPS (2015), *Status of the World's Soil Resources (SWSR) – Technical Summary*, Rome, Italy, Food and Agriculture Organization of the United Nations and Intergovernmental Technical Panel on Soils.

George S., *How the Other Half Dies. The Real Reasons for World Hunger,* Ital. ed. *Come muore l'altra metà del mondo. Le vere ragioni della fame mondiale*, transl.. Luca Trevisani , Feltrinelli, Milano 1978

Iannetta M., *La centralità del cibo: sostenibilità e competitività del sistema agroalimentare, EAI Speciale,* III-2015, ENEA per EXPO 2015

IFAD (2016), *IFAD Strategic Framework 2016-2025 Enabling inclusive and sustainable rural transformation,*

IFAD (2016), *Global Forum on Remittances and Development 2015,* Official Report,

Milan, 16-19 June, the International Fund for Agricultural Development (IFAD)

Murphy S., Burch D., Clapp J. (2012), *Cereal Secrets: The world's largest commodity traders and global trends in agriculture*, Oxfam Research Reports, , London.

Nahon D. (2008), *L'épuisement de la terre, l'enjeu du XXI siècle*, Paris, Ed.Odile Jacob.

Sassi M. (2007), *Sicurezza alimentare e sovranità alimentare: aspetti tecnici e impegno politico per la lotta contro la fame*, paper in XLIV Convegno SIDEA – Produzioni agroalimentari tra rintracciabilità e sicurezza: analisi economiche e politiche d'intervento, Taormina, 8-10 novembre.

Sonnino A. (2014), I limiti della risorsa terra e delle altre risorse naturali,

EAI - *Energia, Ambiente, Innovazione,* n,6, 2014, 102 (DOI 10.12910)

World Bank **(2015),** *FAQs: Global Poverty Line Update*

http://www.worldbank.org/en/topic/poverty/brief/global-poverty-line-faq

VISION, ACTIONS AND PROPOSALS

BY

MEMBERS OF VARIOUS BODIES

WHAT EUROPE IS DOING

Brando Benifei

European Parliament

Good Morning Ladies and Gentlemen and thank you for the invitation to this event.

Unfortunately I cannot attend this meeting on Food, Geography and Security Policies organized by Geoprogress, due to commitments here in Brussels.

Nevertheless, I would like to give my support to this initiative, on food security for humanity, which I see involving a wide panel of experts on the subjects.

I will leave all the technical aspects to the scientists and researchers present here but I wish to give you a political view of what Europe is doing in order to tackle the challenge of guaranteeing proper supplies of food to the world.

Access to food remains a challenge in itself, with 800 million people suffering chronic hunger and 160 million of children suffering from malnutrition and stunted growth.

Beyond this crucial question, ensuring that food, once obtained, provides adequate nutrition is another key point. Improving nutrition in developing countries means enabling poor people, and notably mothers and children, to adopt or maintain diets of sufficient nutritional value and to access healthcare and safe water.

Food has a strong social and cultural value and that is why it should never be used as an instrument of political and economic pressure. Nevertheless, with 1.3 billion tonnes of food produced for human consumption every year wasted or lost in the supply chain, the challenges to face are very big.

Europe, through its cooperation, has played a leading role in confronting hunger, addressing all aspects related to poverty and seeking to support access to sufficient, safe and nutritious food for all and at all times.

The first biennial report on *'Implementing EU food and nutrition security policy commitments*', released last year by the Commission, describes the successful achievements of EU policy on food and nutrition security in the poorest areas of the world.

Many targets have been reached with funded programmes to help and support regions to prepare and put in place policies that boost food and nutrition security, such as policies that integrate markets for agricultural produce, control animal disease, set food standards and ensure food safety. To reach that purpose, we spent €151 million on 98 regional programmes to support regional agriculture and food and nutrition security policies from 2012 to 2014.

But more food is not enough: people need better food too, the right kinds of food. This is especially important for mothers and young children and that is why Europe funded projects that encourage breast-feeding, home gardens for growing fruit and vegetables, and growing and eating foods fortified with vitamins and minerals. For

enhancing nutrition, Europe has spent more than €467 million on 278 programmes in 63 countries.

So Europe plays a key role in the fight for global food security. This goal is also pursued internally through the Common Agricultural Policy - CPA -, which supports farming that secures food safety and promotes sustainable and balanced development across all Europe's rural areas, including those where production conditions are difficult.

Since its creation, the CAP has always been adapted to respond to the challenges of its time. The new agreement on CAP reform reached in 2013 is the result of three years of discussions and intensive negotiations, offering a more holistic and integrated approach to policy support. Specifically it introduces a new architecture for direct payments to farmers which are better targeted and more equitable, an enhanced safety net and a strengthened rural development.

My political group - the S&D - struggled for a far-reaching reform of agriculture: we think that CAP must guarantee that public funds are transparently used and that they are targeted on encouraging farming activities, which give benefit to society but are not rewarded by the market, such as protecting the environment, providing a proper landscape management, assuring biodiversity and employment in rural areas.

We think that funds should be based on contractual payments, replacing the current system of generalised subsidies, and they should be granted only to reach farmers whose income comes substantially from farming.

The reformed CAP goes in the direction of S&D priorities: it promotes the production of sustainable, high-quality food, durable management of natural resources and well-balanced land use, and helps combat climate change. It should be able to cope with volatile prices for food and agricultural raw material, guaranteeing the EU's role in global food security.

I agree with these principles which are also included in the Milan Charter, signed during EXPO 2015, an important step forward in order to reach the goal of eradicating hunger in 2030, which is one of the 17 sustainable goal included in the 2030 EU agenda for a sustainable development.

Such sustainable development should also include the reduction of inequalities: personally I am involved in many initiatives directed towards full employment, social equality, tackling social exclusion and ending poverty.

I think that also the elaboration of a proper strategy of food security for humanity requires a cooperation of a network of citizens, institutions, researchers, businessmen and policy makers aiming at building a better world, peace and well-being, free from hunger and other humiliating deprivations.

Well I hope I was able to offer you a panorama of what Europe is doing in order to face the problem of food security and all the current policies that deal with this issue. Still a lot has to be done, but the EU and the Parliament itself are on track. I wish you all the best and I hope you will have a very fruitful discussion.

Thank you very much.

AGENDA 2030: THE ROLE OF RURAL TRANSFORMATION

Some key areas of focus to drive change[31]

Adolfo Brizzi

Fund for Agricultural Development (IFAD)

The new global development agenda is a unique opportunity to refocus policy, investments and partnerships on inclusive and sustainable rural transformation. Without this, rural-urban inequalities will deepen, cities will struggle and global food security will be at risk. Conversely, rural transformation can be a powerful engine of sustainable development in all its aspects – from economic growth to poverty eradication, from a healthy environment to inclusive societies, from gender equality to food and nutrition security. There are many entry points through which to is possible to promote rural transformation. In particular, IFAD has identified four clusters of issues of universal resonance, each underpinned by five target areas. While not covering the whole rural development agenda, these provide a map of areas where catalytic action may be inspired by new goals, targets and indicators adapted to different country circumstances.

What future does the world want?

Women and men from all walks of life want a world where extreme poverty has disappeared, everyone is well fed, all children have access to quality education, economies are dynamic and the benefits from growth are equitably shared, decent jobs are available to everyone, natural resources are used sustainably and temperature increases from climate change are manageable. People want a world where they can live in peace and their voices are respected in public decisions. This future is ambitious but achievable. The challenge is to ensure that this shared ambition is reflected in the new development agenda.

Inclusive and sustainable rural transformation is key to the future we want

Achieving this future requires a fresh look at rural areas and their inhabitants. Current patterns of economic growth are often accompanied by spatial inequalities that undermine progress towards inclusive, peaceful and dynamic societies. Meanwhile, a growing urban world is increasingly in need of a range of goods and services that must come from rural areas – from nutritious food to jobs, energy, environmental services and much more.

[31] This overview document represents a synthesis of 4 policy briefs produced by IFAD, complemented by joint work with the Food and Agriculture Organization of the United Nations (FAO) and the World Food Programme (WFP) in the area of food security, nutrition and sustainable agriculture. IFAD's work in Agenda 2030 is inspired by its unique mandate to invest in poor rural people to enable them to overcome poverty and to transform their lives.

A transformation of rural spaces, productive sectors and societies is needed – one that is inclusive, dynamic and sustainable. To promote this requires a new development paradigm that empowers rural people to play their economic, social and environmental roles to the full. Agenda 2030 and the 17 Sustainable Development Goals (SDGs) can encourage implementation modalities that give explicit attention to rural women and men and their role in building a better future.

Four key issues around which to catalyse rural transformation

While the entry points to promoting rural transformation will be context-specific, there are four key issues that can help catalyse the transformation.[32] These are:

- Leveraging the rural-urban nexus for development
- Promoting an empowerment agenda for rural livelihoods
- Investing in smallholder family agriculture for global food security and nutrition
- Promoting the resilience of poor rural households.

Leveraging the rural-urban nexus for development

Rapid urbanization is transforming the global landscape and generating new challenges and opportunities for development. In many contexts, it is accompanied by rural concentration of extreme poverty, despite the immense potential of and demands on the rural sector. Moreover, growing rural-urban interdependence often coexists with major gaps in rural-urban connectivity – in infrastructure, energy, and the smooth flow of people, goods, knowledge and finance. Going forward, the rural space needs to play a central role in creating more sustainable and inclusive economies and societies. As the rural population grows, it is imperative to boost rural economies and jobs for young people in particular. And as the world becomes more urban, the rural space has to transform to expand the efficient and sustainable supply of a wide range of goods and services.

A policy agenda around these issues requires investing in quality data concerning rural areas and rural societies. Systematic rural-urban disaggregation of data related to the new agenda is of critical importance to build a solid evidence base. The agenda needs to cover a number of key target areas, such as securing the asset base of rural women and men, addressing rural-urban gaps in quality of services and opportunities, strengthening rural-urban connectivity, and inclusive territorial and ecosystem governance.

Promoting an empowerment agenda for rural livelihoods

Many countries have made great progress in reducing poverty over the last 30 years. However, in many parts of the world poor rural people remain marginalized – socially, economically and politically. Indeed, growth processes have at times increased

[32] Each of these issues is addressed in an IFAD policy brief, available at http://www.ifad.org/governance/post2015/index.htm.

marginalization. For example, long-standing factors limiting secure access to land for rural women and indigenous peoples have been reinforced by new pressures on the natural resource base linked to rising prices of agricultural commodities, urbanization, mining, land-use conversion and deforestation. Therefore, a broad empowerment agenda for rural livelihoods is a moral imperative. This includes fostering a range of interrelated processes that enable rural people to access and secure control over assets and to contribute to decision-making processes at all levels. In many contexts, promoting rural empowerment is also a smart strategy to boost inclusive growth. It is essential to build the capacity of rural people to drive change in key areas of sustainable development such as natural resource management and agricultural productivity.

In the context of Agenda 2030, it is important to focus attention on inclusive and secure access to land, natural resources and productive services, promoting the participation of rural people and their organizations in markets and public life, strengthening their access to decent job and business opportunities, and supporting rural women's empowerment and the rights of indigenous peoples.

Investing in smallholder family agriculture for global food security and nutrition

Agriculture is strategically important for sustainable development. It is a major employer and a means of reducing poverty. Agriculture is a key user of natural resources and a provider of environmental services (including carbon sequestration). And it is the sector on which food security and nutrition chiefly depend. In coming years, agriculture needs to change profoundly to meet increasing demands while facing harsher environmental conditions, more competitive and volatile markets, and the effects of climate change.

Small family farms have a central role in food security and nutrition from the household to the global level. While highly heterogeneous, in the aggregate they provide income and environmental services to a large share of the world's population. Growing demand for high-quality nutritious food and other agricultural goods will create opportunities for many small farms to become viable businesses. However, many of the factors underlying rural poverty and marginalization constrain the entrepreneurship of smallholder farmers, in particular women.

Critical target areas around this challenge include small farmers' (women's and men's) secure tenure over natural resources, their access to productive services, finance and markets, and balanced growth in agricultural productivity, sustainability, resilience, efficiency and nutrition sensitivity. Moreover, sustainable value chains and inclusive business models are key to leverage growing private investments and reduce transaction costs through innovative partnership approaches.

Promoting the resilience of poor rural households

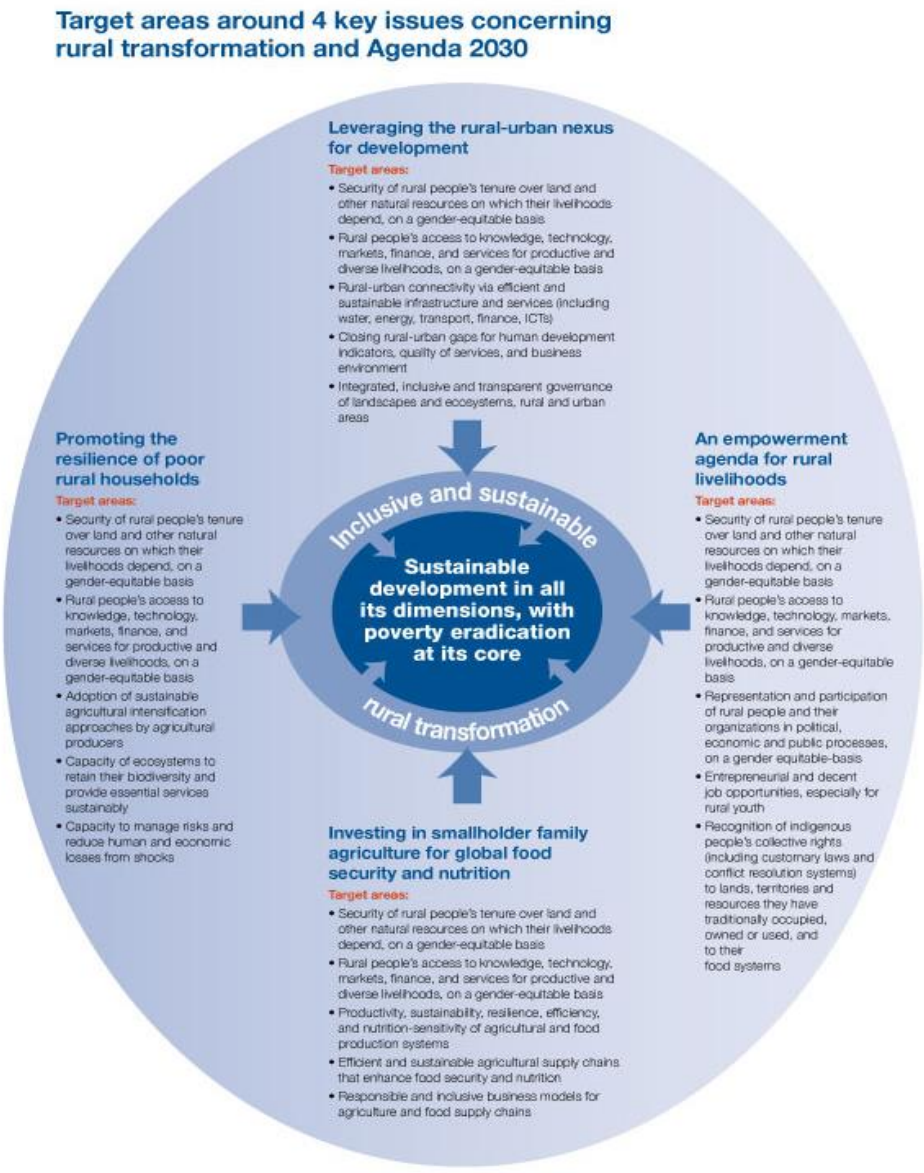
Rural people are vulnerable to a range of shocks that push them into poverty, keep them poor or prevent them from moving out of poverty, as they are unable to seize new opportunities linked to urbanization and to a growing demand for rural goods and services. Some of the risks that rural households face are long-standing, while others are new or increasing. For example, new types of market risks and sources of price volatility are emerging, the natural resource base is increasingly degraded or scarce, and

climate change has a multiplier effect on virtually all risks that rural households face. Many risks are also interlinked and reinforce each other, such as environmental risks and price volatility.

Understanding risks and shocks that affect poor rural households is a precondition for policies and investments to enable them to fully participate in rural transformation. Public institutions play an important role in realizing strategies that promote resilience, such as by providing incentives for investments that reduce vulnerability to shocks (for instance climate-proof infrastructure); providing public goods that buffer shocks or that improve risk management capacity (social protection and education); fostering well-functioning markets; and ensuring good governance.

However, developing and enforcing these strategies requires collaboration among public and private actors at all levels. Rural people's own institutions play a vital role, and their own institutional resilience also requires support.

Relevant target areas related to this challenge include secure tenure over land and other natural resources, access to knowledge, finance, services, markets and technology, adoption of sustainable agricultural intensification approaches, access to risk management tools, and healthy ecosystems.



10.000 GARDENS IN AFRICA TO CULTIVATE THE FUTURE

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Abstract

Why is Slow Food helping to plant gardens in Africa? Because a garden tended by a school or a community can guarantee food security, the protection of biodiversity and the preservation of culture. Supporting small-scale agriculture on the continent of Africa can provide poverty-stricken communities with a tool for building their own futures.

1. Hunger for justice

"The shame of hunger can and must be defeated within this generation; commitment in this regard must take a political priority in all international forums, along with national and civil society" (Carlo Petrini, FAO Special Ambassador Zero Hunger for Europe)

At the 1974 World Food Conference, governments examined the global problem of food production and consumption, and solemnly proclaimed that "every man, woman and child has the inalienable right to be free from hunger and malnutrition in order to develop their physical and mental faculties". Since then, the number of hungry people, instead of reducing, has augmented. In 2008 the FAO high-level conference on World Food Security announced that instead of reducing the ranks of the hungry to 400 million, as had been projected by the 2000 Millennium Summit, hunger has increased (De Schutter, 2008).

The existence of millions of people chronically hungry and undernourished in developing countries represents a fundamental contradiction in today's world. It shows that there is something fundamentally wrong in the food production system, and the resources with which to access it. Especially when considering that there is more than enough food in the world to feed everyone. In fact, over the last 20 years, world food production has risen steadily at over 2% a year, while the rate of global population growth has dropped to 1.14% a year (Faostat).

In Sub-Saharan Africa, still one in every four people is hungry and progress in reducing the number of undernourished has been alarmingly slow (FAO, 2014).

According to the last report on the State of Food Insecurity in the World, nearly 217.8 million people in the sub-Saharan region are undernourished, while in 1990-92 they were 175.5 (FAO, 2015).

Several factors are claimed to have had an influence on this increase.

First of all this scenario reflects the region's high population growth rate: the Sub-Saharan African population has grown from 492 million in 1990 to 962 million in 2015, a 95% increase over 15 years (United Nations, 2015).

Other factors to be taken into account are: rise in food prices (for example the acute food crisis of 2007-8 and the food prices inflation of 2010-11), recurrent droughts and climate shocks, political instability and conflicts.

One element to be considered is also the impact of globalisation on Africa agriculture, such as climate change, globalisation of markets and the search for new sources of green energy (the so-called agrofuels boom).

1.1. African food system paradoxes.

Africa is probably the continent where the symptoms of an unhealthy and unequal food system are much evident. Despite the abundance of natural resources in Africa food insecurity is increasingly common.

Why a continent so is rich in land, where the agriculture sector has an enormous potential, is still struggling for food security?

Why today African countries are obliged to import most of the food stocks when in the Sixties, at the dawn of decolonization, they produced enough food for the domestic market and were even able to export?

These were the questions Slow Food ran in when, in 2004, started collaborating on the field with the local communities, small farmers and producers.

As an international grassroots organization working to defend the right to good, clean and fair food for everyone, Slow Food began to reflect on which were the forces driving the local food systems in Africa and therefore on who was shaping the continent's future.

The development models imposed, over the last 4 decades on African countries, by the international financial institutions and the global industrial agri-food complex (made up of multinational grain traders, giant seed, chemical and fertilizer corporations, processors and global supermarket chains) have marginalized local production, focusing on a few cash crop products.

During the Sixties, when most African states won independence from European rule, the so-called "Green Revolution" was launched throughout the continent. Its objective was to increase food production, focusing on modern agricultural technologies (intensive use of chemicals and fertilizers and hybridization of various crop to maximize the yield) and monocultures.

Since then a migration has begun: from traditional agriculture – based on local varieties and on traditional knowledge – to agribusiness that means: monocultures for exportation and the massive and systematic use of chemical fertilizers and pesticides.

This growth receipt has been based on the assumption that export crops production would have allowed Africans to pay off their foreign debt and use the revenues from a

modernized industrial and manufacture sector to import their food. The result was that African developing countries saw their only export opportunity in products like coffee, tea, cashew nuts, cotton, bananas and other crops that cannot be grown in the northern areas of the world, and have been forced to buy the cereals they need to survive on the international market, at prices which have risen considerably over the years. The World Bank reported that the global world food prices rose by 83% from 2005 to 2008 (World Bank, 2008) and in the winter of 2007, when food price inflation exploded on world market, in spite of the record grain harvests, the number of hungry people jumped dramatically to 982 million in just one year (USDA, 2008).

Another element that has influenced the African food system is the highly protectionist policy of the United States and Europe towards cereal and textile products. During the Seventies the high level of productivity achieved by European countries led to market saturation and increasing surpluses. So the European governments started to subsidize the exportations in order to dispose of agricultural surpluses. African countries were flooded with subsidized grain from the U.S. and Europe that was then sold at incredibly low prices, generated unsustainable competition for local small-farmers and producers. In this way, the western agri-business industry, thanks to the huge public subsidies, has keep on selling the surplus on the African markets at prices far below the costs of production, generating unfair competition that has ruined small-scale African farmers. This has tied Southern food security to global market dominated by rich Northern countries.

Consequently, a state of food dependence has grown, because income from exports was often lower than the amount needed to buy the cereals they no longer produced domestically. This has leaded to a continuous reduction in the proportion of land used for growing subsistence crops in favour of an expansion of export crops, which only benefit a few landowners and exporters.

In general, these export-oriented growth models have led to the reliance of African developing countries on imports, of primary products too, and vulnerability to the trends in the world market and oil prices. The negative externalities on the local food systems of these policies has been further exacerbated by the predatory pricing of dumping, which has driven local producers out of the local markets.

The exclusive focus on increasing production has also had severe environmental and social impacts: a massive loss in agro biodiversity, the reduction in water tables, the salinization and erosion of soils, the displacement of millions of peasants to fragile hillsides, shrinking forests and urban slums.

The loss of local biodiversity impoverishes rural communities, which are forced to abandon their lands and move to city outskirts or to replace local products with monocultures destined to Western markets, thus severely compromising their own food security. Biodiversity in African countries is also jeopardised by a new phenomenon which has been gaining ground in recent years: the contracts signed by African governments to sell out millions of hectares of arable land to governments and corporations of rich countries. Opponents denounce such contracts with the name of "land grabbing" and highlight the risks that these agreements – often signed after secret negotiations – pose to food sovereignty.

To summarize, what Slow Food found out in Africa (as in many other parts of the world) was that the twentieth century food system paradigm has turned out to be

unsustainable and that unregulated global markets, speculators and global monopolies were deciding de facto the future of continent's food system, compromising the autonomy and the cultural identity of the communities.

1.2. An alternative strategy.

"For years the Westerners have explained to us that everything we were doing was wrong. They said our techniques were inefficient, that our products had to be replaced by more productive crops. Now at Terra Madre everyone says that our story is important, that we have to recover the wisdom of our ancestors, be proud of our roots, cultivate our own grains and the fruits selected by our forefathers. These are new words for us" (Cameroonian delegate at Terra Madre[33] 2012).

The present global agrifood system is essentially associated with the idea of the global market, of the control of nature, of the pursuit of efficiency and scale production and consumption. It is rooted in the belief that local agriculture has to serve the global market. This is the system embodied by the imposition of cash crops over subsistence crops; it has also been one of the causes of the extreme price fluctuations on the world cereal market over the last decade. Food has thus been transformed into a commodity without any regard for the cultural and social implications of this transformation.

According to Slow Food (but this diagnosis is broadly shared), the global hyper-productive food system market-driven system, shaped by industrial agriculture to maximize efficiency gains, with one billion people facing starvation today, has failed. Not only it has not fed the planet but has also demonstrated not to be affordable, given the high social, environmental and cultural costs related to its application.

"Food is not a commodity. It is a living thing and we have to learn to respect food and especially those who produce it" (Carlo Petrini, 2014).

In order to contribute to stopping this trend, Slow Food is working to revitalise local production and distribution chains, rediscover and document local know-how, and promote local food as a way to ensure food security, safeguard and support local species and breeds.

Slow Food envisages a more sustainable food system recognizing the interdependence of different aspects of food production and consumption: economic aspects, environmental aspects and socio-cultural aspects.

For Slow Food attaining a more sustainable food system means:

<u>Conserving and promoting biodiversity and ecosystems</u>

In the global scenario, the conservation of biodiversity and the restoration and protection of ecosystems must become shared priorities at policy level. Such efforts, which should be seen as an investment in terms of natural capital, require radical changes in the models and practices of economic development worldwide. The conservation of biodiversity calls for the development of different modes of governance

[33] Slow Food's Terra Madre network was created in active 2004 and brings together members of the food production and distribution chain to promote sustainable agriculture, fishing and production. The network involves small-scale farmers, breeders, fishers, food artisans, academics, cooks, consumers and youth groups from over 160 countries. Every two years, the Terra Madre network meets for the global gathering of food communities in Turin (http://www.terramadre.info/en/).

at the global, national, and local levels. Biodiversity conservation can only be effective if public awareness and concern are substantially heightened and if policy makers have access to reliable information upon which to base their choices. Slow Food promotes the protection of food biodiversity, first and foremost through knowledge (for instance the mapping of traditional products, native breeds and local edible plant varieties and ecotypes through the catalogue known as the Ark of Taste), and then by supporting and promoting specific supply chains (cultivation, breeding, processing). One such successful model for protecting biodiversity is the Slow Food Presidia project (on-site practice), which aims to safeguard native breeds and local plant varieties, helping producers to work together (under lean association schemes) and collaborate to promote sustainable practices, as well as to protect traditional techniques and knowledge, to safeguard specific landscapes, to promote their products and find suitable markets. Slow Food believes that by protecting their own food products, plant varieties and animal breeds, local communities can thrive and provide sources for decent livelihoods.

Adopting sustainable production methods

A very rough distinction among the different production models distinguishes between industrial production and small-scale production. There is a tendency to associate the former with the generation of profits and development, while the latter is often perceived as an activity aimed at mere subsistence. However, such a narrow vision does not take into account the fact that, following FAO's State of Food and Agriculture 2014 report, small-scale producers are the custodians of about 75 percent of all agricultural resources in the world and produce about 80% of the world's food, if we consider the food system in its entirety (meaning in its complexity). Protecting sustainable methods of food production and small-scale food production means protecting the environment and securing a productive capacity. Natural resources are managed sustainably ensuring climate-friendly food production as well as ensuring adequate food and water for future generations. Artisanal systems do not generally cause imbalances between species and are more respectful of local resources and biodiversity.

Keeping food waste and losses to a minimum at all stages of the food supply chain

Forecasts all seem to agree that in 2050 there will be about 9 billion people sharing the planet. Considering that today (with a world population of 7 billion) there are already one billion people who do not eat adequately, the outlook is not good. The most disparate voices are increasingly stressing the fact that, in order to feed everyone, it will be necessary to increase productivity by 70%, with cultivated arable land decreasing in the meantime. However, there is an essential piece of information that is being ignored, namely that today the Earth already produces enough food for 12 billion people, but 40% of all food produced is wasted, never getting close to the table. Slow Food strongly believes that food waste and loss must be fought, and that to do that it is necessary to restore value to food and sacredness to the moment of its consumption. In a world where many people do not have enough to eat and resources are limited, Slow Food believes that the prevention and reduction of food loss and waste must urgently be given a key place on the political agenda.

The system in which we find ourselves as consumers, producers or intermediaries is founded on a mechanism of waste and overproduction, and on the rapid selling-off of stock to put new products on the market. In other words, waste is no accident; it is organic to the system.

Promoting a new consumption model where people are not merely consumers, but co-producers

The so called "consumer" is the real key to change, whether in consolidating the industrial system or bringing radical change to habits, behaviours and priorities, ushering in a new development model based on sustainability. Consumer choices have a significant impact on the entire food system and its sustainability. The alliance between producers and consumers is also key to creating short supply chains, minimizing the number of steps involved, the distance travelled by food (food miles), as well as all costs and potential losses (i.e. food losses). Consumers hold a great deal of power: with increased awareness of the value of their choices, they are in a position to redirect the market and production. Slow Food coined the term "co-producer" to highlight the power and political role of the consumer.

Protecting traditional knowledge

Local and global communities are experiencing a loss of traditional knowledge and values, which goes hand in hand with a decline in cultural diversity and the dilution of a sense of community. Slow Food defends traditional knowledge, as a source of wisdom and know-how that lies at the core of technical and scientific learning. If properly protected, it can become a vital element in local economic systems and help spread environmentally friendly methods of food production and consumption. The participation of farmers is an essential element in ensuring the spread of sustainable practices and, for this reason, the horizontal sharing of knowledge among farmers is of crucial importance.

2. Slow Food cooperation model

Slow Food is not a traditional development agency, but with its activities it works also in this field, carrying out accompaniment, support, networking and promotion of rural development in areas in both the global north and south.

Slow Food's vision of cooperation and development is based on food as a driving force for change.

The central role of food is the cornerstone on which to build a new political vision, a new economy and new social environment.

Recognizing the central role of food implies a belief that the right to food is a primary human right, the right to be free from hunger. We have to fight hunger because hunger is, above all, a form of injustice, of arrogance towards other human beings who have the same rights as we do.

Land rights and soil fertility, the healthiness of air and water, biodiversity, pristine landscapes, fair wages, health, knowledge and memory – these are rights, not privileges. It is a holistic approach which centres on food but encompasses other issues – biodiversity and environmental protection, promotion of local communities and their traditions and culture, fair remuneration for producers – normally viewed as separate.

Slow Food's action fits into a framework of renewed respect for the heterogeneous needs of beneficiaries. It provides cultural mediation and a bottom-up approach, activates local networks (producing social capital) and introduces an innovative management approach to projects by delegating them entirely to local networks (no expatriate staff permanently present). Slow Food determines that the main actors in this process are the food communities which, through a participative project style, can become the hub of local development.

Focusing on agricultural development means focusing on production. Focusing on food, on the other hand, means concentrating on people, culture, traditional knowledge. It means involving farmers, herders and fishers, but also chefs, students and teachers.

Slow Food believes food is tied to many other aspects of life, including culture, politics, agriculture and the environment. Through our food choices we can collectively influence how food is cultivated, produced and distributed, and as a result bring about great change.

Everywhere it works, Slow Food starts with an understanding of the place and the local community. It identifies a network of interested people and begins mapping the local agrobiodiversity (such as plant varieties, animal breeds, food products, farming and fishing techniques, traditional recipes). Only after this phase is it possible to choose how to proceed, deciding together with the communities which path to take: Prioritizing education in schools or developing Presidia[34] ? Involving chefs or focusing on family consumption? Promoting the local market or seeking international sales channels? Starting with which products? Planting the gardens where? Growing which crops?

Only an in-depth understanding of the territory will allow "perceived needs" be cleared away. Without this initial research, the risk is that the same responses will be offered to everyone, giving the communities what they ask for out of habit, or what has been suggested to them by previous development projects. This is the case, for example, with the many wells, built in haste and often abandoned just as quickly. Sometimes they are truly necessary, but before building a well and buying a pump that will need fuel and maintenance, there are many other things that can be done: choosing a better-suited plot of land, growing hardy varieties in the right season, collecting rainwater, using drip irrigation systems, protecting the ground with mulch or planting shade trees to help the soil hold moisture.

The story is similar with seeds. To help people grow their own food, packets of hybrid seeds are often distributed to the communities, rather than relying on the wisdom

[34] Slow Food Presidia support quality production at risk of extinction; protect unique regions and ecosystems; recover traditional processing methods; and safeguard native breeds and local plant varieties. Each project involves a community of small-scale producers and provides technical assistance to improve production quality, identify new market outlets and organize exchanges with producers internationally through the large Slow Food events.
(http://www.fondazioneslowfood.com/en/what-we-do/slow-food-presidia/).

of women, who are perfectly able to select the best seeds, adapted to the local area, and save and reproduce them on their own.

Starting from an understanding of the local area and a dialogue means avoiding careless errors and following a path that might not be perfect or swift, but has the great value of being shared.

2.1 The Slow Food Gardens project.

"Now we realize that we have done much more that simply create gardens: we have create an important network that is growing and working to change Africa, to offer children a future of peace and justice, and to guarantee everyone access to good, clean and fair food" (Edie Mukiibi, 29 years old, Ugandan agronomist, Slow Food Vice President).

In Uganda Edie Mukiibi, a young agronomist, graduated from of Makerere University and part of Slow Food movement, initiated in 2010 a project involving 17 school gardens. This is because in the country young people were abandoning the countryside and contempt for farming work was widespread partly because schoolchildren were often sent to work in the fields as punishment for bad behavior. He wanted to invert this tendency and the way agriculture was perceived by children. The same year the Slow Food network launched a community gardens project in Ivory Coast, managed entirely by groups of women.

The idea was to promote a model of sustainable agriculture which is respectful of the environment, its ecological equilibrium and the culture of local communities, and it has since been enthusiastically welcomed in many other countries across the continent (at present, the Slow Food Gardens in Africa project is active in 35 countries and has created more than 2000 gardens).

The project's main objective is to build a network of informed people who are aware of the value of their own land and culture, and active in defending Africa's extraordinary biodiversity, its wealth of traditional knowledge and farming methods. These are all threatened by policies that promote farming for export, the massive and increasing use of chemical fertilizers on the soil, and foreign investors who are buying up the most fertile lands for small change.

This network is an important step towards a more sustainable future, bringing back a way of farming that is conscious of the needs of local communities, liberating them from the designs imposed by international financial institutions and foreign investors.

The Slow Food gardens are designed, created and run by the African communities, thanks to the initiative of the Slow Food members who are engaged mostly on a volunteer basis. Slow Food's International office helps the local referents to develop these activities through technical support, training sessions, the exchange of experiences among members of the international network, and through a monetary contribution to help set up the vegetable gardens.

Slow Food distinguishes between a community garden and a school garden. - A community garden's main priority is to provide sustenance to families, and, to some extent, allow them to supplement their income by selling products (though this should

never become the main objective). That being said, the garden is also an important school for the whole community, who learn to value the local products, to reproduce seeds, to respect the land and to better manage water.

A school garden has a primarily educational function. It is used to teach children and teenagers about local foods and recipes for vegetables and fruits, about working and playing in a group, and so on. The school garden's products are also used for school meals, but it cannot provide a regular supply. The schools are often very large (with several hundred children) and a garden's products can be used to accompany rice or millet for a few weeks or served at festive events. The school garden, then, cannot resolve the problem of how to feed the children, but serves as an open-air classroom which gives them the tools for improving the quality of life of their families (many parents replicate at home what their children have learned at school). Additionally, some children, after their experience with the garden, go on to proudly pursue a career in farming.

2.2. Ten essential ingredients for a Slow Food Garden

(1) They are created by a community

The gardens bring together and value the capacities of all the community members uniting different generations and social groups (village or school associations, local administrators or non-profit organizations). They recover the wisdom of older generations, make the most of the energy and creativity of younger people, and benefit from the skills of experts.

(2) They are based on observation

Before planting a garden, it is necessary to learn to observe and to get to know the terrain, local varieties and water sources. The garden must be adapted to its surroundings, and local materials should be used to make fencing, compost bins and nurseries.

(3) They do not need a large amount of space

By looking creatively at the space available, it is possible to find somewhere to put a food garden in the most unlikely places: on a roof, by the side of a footpath and so on.

(4) They are places of biodiversity

Slow Food gardens are places for local biodiversity, which has adapted to the climate and terrain thanks to human selection. These nutritious and hardy varieties do not need chemical fertilizers and pesticides: vegetables, medicinal plants, culinary herbs and fruits trees (bananas, mangos, citrus).

(5) They produce their own seeds

Seeds are selected and reproduced by the communities. This means that every year the plants become stronger and better suited to the local area, and money does not need to be spent on buying packets of seeds.

(6) They are cultivated using sustainable methods

Natural remedies based on herbs, flowers or ash are used to combat harmful insects or diseases.

(7) They save water

Once again, an approach based on observation and creativity is fundamental. Sometimes it only takes a gutter, tank or cistern to collect rainwater to resolve seemingly insurmountable problems and avoid more expensive solutions.

(8) They are open-air classrooms

Food gardens offer an excellent opportunity for teaching adults and children alike about native plant varieties, promoting a healthy and varied diet, explaining how to avoid using chemicals and giving value to the craft of farmers.

(9) They are useful, but also fun

Food gardens are a simple and inexpensive way of providing healthy and nutritious food.

But even in the most remote villages and the poorest schools, Slow Food gardens are also a place for games, celebrations and fun.

(10) They are networked together

Neighboring gardens exchange seeds, while those further away exchange ideas and information. The coordinators meet, write to each other and collaborate. Twinnings between school and convivia (Slow Food local chapters) from all over the world allows the creation of new gardens across the continent.

2.3 Not just any garden: the project's philosophy

A Slow Food garden supports and regenerates itself. It needs few external resources to get started: the decisive factor for its launch and success is the spirit of participation in the community involved. After a year or two, the garden will become autonomous, and start generating resources: It will produce seeds and compost which can be used to create other gardens, and part of the harvest and the resulting food products (jams, juices, other preserves) can be sold to supplement family income or to buy school materials.

A Slow Food gardens is:

- a concrete model of sustainable agriculture, adapted to different environmental, social and cultural contexts and easily replicable
- an agro-ecological food garden.: a balanced system in which the intelligence of man modifies nature in order to be able to utilize its products without harming and impoverishing it, sustaining the physical, chemical and biological mechanisms that regulate nature's cycles
- an instrument to safeguard local agrobiodiversity .Traditional, local varieties are preferred for Slow Food gardens. These are the result of centuries of selection by humans, and thanks to this process they are the best adapted to the local climate and terrain. They are more resilient to external attacks and require fewer inputs (fertilizers and pesticides). They are therefore more sustainable from both an environmental and an economic point of view. Choosing traditional varieties means safeguarding biodiversity, which offers the

best insurance for our future. Diversity allows plants to react to unexpected events, to adapt to climate change and to resist parasites and disease. A biologically diversified system contains the antibodies for re-acting to harmful organisms and maintaining its equilibrium. A system based on a limited number of varieties, on the other hand, is very fragile.

- a food source to improve dietary patterns with a strong socio-economic value .Slow Food gardens help to diversify and improve the daily diet by encouraging people who mainly eat cereals and pulses to eat local fruit and vegetables. The foods that are cultivated and harvested are first and foremost for eating (by the families or for school meals). In seasons where there are surpluses, these can be turned into sauces, jams, juices, flours or dried fruits and vegetables; sold (fresh or processed) at local markets or to nearby restaurants; or they can be cooked and sold at the small eateries that are sometimes started next to the gardens. The harvest from school gardens can also sometimes be sold at the local market, and the proceeds used, for example, to buy materials for lessons, or other equipment for the garden. Moreover a community garden can also assure subsistence so those cultivating it are freed from dependence on other external sources.

- an important tool for education: cultivating the garden offers the chance to learn more about local plant varieties, how to sustainably manage soil and water, how to diversify one's diet and how to cultivate food using environmentally friendly methods. In the garden, work is done in groups, and learning takes place thanks to the exchange with the whole community. Additionally, different educational activities can be held in the garden. For example, schools and communities can organize theoretical and practical cooking classes so that children and young people can get to know local products and food traditions. Tastings of produce from the garden can also be organized, as can festivals and other initiatives to communicate the importance of local consumption to the whole community.

A food garden's close links to human and environmental health offer the possibility of raising awareness about different issues among the community: the role of medicinal plants and fresh vegetables in treating malaria or helping people with HIV, the importance of disposing properly of waste and respecting the environment, the risks faced when burning land before cultivation etc...

Thanks to its interdisciplinary value, many subjects can be studied in the school garden such as history, through the spread of gastronomic traditions and crops; geography, through the origin of products; as well as mathematics and geometry, indispensable to planning the garden and calculating the expected value of its produce.

2.4 Slow Food Gardens project's sustainability.

One of the main challenges facing the project's coordinators during normal operations with the communities is maintaining the gardens' agroecological activity once the initial motivational and financial push drops off and various difficulties and obstacles might have started to emerge.

The project includes various measures to help ensure each agroecological garden is both socially and economically sustainable in the medium to long term.

Social sustainability through the involvement of the community. - One of the indispensable and compulsory preconditions for starting a garden is the involvement of a community. Not only in the narrow sense of the community directly involved in running the garden, but members of the community in a broader sense (people living in the village/neighbourhood/area where the garden is located) must also become participants. The project must seek to inspire each one of them to contribute all the material and immaterial resources they can.

From the very first visit to the site where the garden will be created, and then in an on-going way, all the stakeholders are kept informed, regularly consulted and invited to collaborate on the project, including official figures, religious authorities, representatives of various social and economic groups. Here, the role of the African coordinators working in the field is essential, and distinguishes Slow Food's work from that of other traditional NGOs, who often hire expats. The fact that the Slow Food gardens are designed created and managed by the beneficiary communities, means that in each individual case, the solution best adapted to the context can be identified and mediated by people within that context, who are the project coordinators.

Another fundamental element giving a greater guarantee of sustainability is "proximity." The project's local coordinators have direct relationships with all the subjects involved and seek to mediate between the different positions, thus limiting the emergence of potential conflicts that could threaten the project's success, while at the same time encouraging everyone's participation. In this way, the garden becomes a shared project, understood as belonging to the whole community, not just the initiative of a specific school or group of families.

Some best practices in regards to this, gathered from experience in the field, are:

- Schools and private individuals granting land for the project for free.
- Local authorities making specific funding lines available to give continuity to the project.
- Local livestock farmers providing organic manure for the gardens.
- Growers donating local seeds to the gardens for free.
- Parents working in the school gardens alongside their children.

Social sustainability through a permanent training process. - A second decisive element for social sustainability is the role played by training within the project.

The community/school receives the basic tools for starting the garden, but most importantly they also enter into a process of reflection/gaining awareness about the importance of protecting local food biodiversity and promoting and adding value to traditional food products by using sustainable cultivation methods (which respect the environment and people's cultural identity). Everyone who joins the project does so voluntarily, because they embrace the values that it promotes. Nobody is forced to accept the effectiveness of the proposed model; whoever embraces it is aware of its benefits and so the practical implementation becomes not just a "didactic application" of

techniques learned within the ambit of the project, but the acquisition of a model linked to wider ideas and values of environmental, economic and social sustainability. This voluntary adhesion to the values that the project promotes is another key to ensuring the project's continuity over time.

Social sustainability through integration into the local Slow Food network. - The third essential element is that each garden is not "isolated" but included within a network. Each garden depends on a Slow Food convivium (local chapter), which is responsible for its launch, training and monitoring.

The convivia are also networked together at a national level and meet both physically and virtually. The same goes for the garden coordinators, who are constantly in contact with each other. In addition to the national gardens network, there is also an international network of the various African countries involved and the donors.

The network is a strength for the project, allowing the exchange of best practices and for shared challenges to be overcome together.

The link that often becomes established between donor and supported garden (formed of exchanges of information and updates on how activities are developing) is a decisive factor that encourages the local group to engage in guaranteeing the garden's survival, just as the donor's support is valuable in specific cases where it is necessary to invest additional resources.

Work is also constantly being done so that each garden is integrated into the wider framework of the projects that Slow Food is carrying out in a specific area/region/country (like the Ark of Taste and Presidia projects promoting traditional foods). In this way, synergies are created with other initiatives and shared processes of sustainability can be developed (for example, collaborations with local restaurants, shared activities to raise awareness about the importance of safeguarding native foods at risk of extinction, etc.).

Economic sustainability through the lowering of management costs. - The sustainability of the garden at an economic level (meant here as the availability of material resources for its survival) is reached on the one hand through social sustainability, the foundation on which the project is built, and on the other thanks to the work carried out to create a network of people from the community around the garden project. This network commits to ensuring the garden survives, identifying local sources for the resources needed for activities to be launched and continued.

After a year or two, the garden becomes autonomous and can even generate resources, producing seeds and compost that can be used to start other gardens. Part of the harvest or processed foods (preserves, juices, jams) can be sold to supplement the income of the members and to buy school materials.

Economic sustainability through the acquisition of specific techniques. - In this case, once again the network plays a decisive role, because the individual garden coordinators can meet physically and virtually. They can learn about solutions put into practice by others to deal with the various adversities that arise during normal operations and also in extraordinary situations caused by particularly unfavorable environmental conditions (drought or prolonged rains, for example). The project's coordinators include many agronomists and other experts who are willing to share their knowledge with all the other subjects in the network involved in the project. As well as being able to rely on the

skills and knowledge of local experts (or people with proven experience in agronomy), they can also draw on the additional advice of two Italian agronomists and university researchers.

A food garden is a drop in the ocean compared to the problems Africa faces every day. But if the number of gardens grows from a hundred to a thousand to ten thousand, and they dialog together and support each other, their impact grows. Together, they can transform into a single voice, speaking out against land grabbing, GMOs and intensive agriculture, and in favor of traditional knowledge, sustainability and food sovereignty. And they can represent a hope for thousands of young people.

References

Actionaid International (2008), *Impact of Agro-Import surges in Developing Countries*, http://agris.fao.org/agris-search/search.do?recordID=GB2013203092.

Holt-Giménez E., Patel R. with Shattuck A. (2009), *Food Rebellions: Crisis and the Hunger for Justice*, Londra, Paperback.

Petrini C. (2014), *Opening speech*, Salone del Gusto-Terra Madre 2014, doc. Slow Food.

De Schutter O. (2008), *Building Resilience. A human rights framework for world food and nutrition security. Promotion and protection of all Human Rights, Civil, Political, Economic, Social and Cultural Rights, Including the Right to Development*, Geneva, United Nations.

Holt-Giménez E. (2008), *The world food crisis: what is behind it and what we can do*, Food First, Policy Brief No. 16; v. https://foodfirst.org/wp-content/uploads/2013/12/PB16-The-World-Food-Crisis.pdf

FAO, IFAD and WFP (2012), "Economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition" in *The State of Food Insecurity in the World 2012*, Roma.

FAO, IFAD and WFP (2015), *The State of Food Insecurity in the World 2015*, Roma.

FAO (2015), *Regional overview of food insecurity: African food security prospects brighter than ever*, Accra, http://www.fao.org/3/a-i4635e.pdf

Faostat, http://faostat3.fao.org/home/E

FAO, IFAD and WFP (2002), *Reducing Poverty and Hunger, the Critical Role of Financing for Food, Agriculture, and Rural Development*, Roma.

Moore Lappé F., Collins J. and Rosset P. with Esparza L. (1998), *World Hunger: 12 Myths*, New York, Groove Atlantic.

De Schutter O. (2014), *Report of the Special Rapporteur on the right to food, Final report: the transformative potential of the right to food*, United Nations, A/HRC/25/;

v. http://www.srfood.org/en/official-reports

Slow Food (2013), *The Central Role of Food*, Congress Paper, Congresso Internazionale Slow Food, Istanbul.

Slow Food (2013), *Slow Food's Contribution to the Debate on the Sustainability of Food system*, doc. Slow Food.

Slow Food (2009, 2011, 2012, 2013 2014, 2015), *Slow Food Almanac*, doc. Slow Food.

Slow Food Foundation for Biodiversity (2014), *Social Report*, doc. Slow Food.

Slow Food Foundation for Biodiversity (2014), *10.000 gardens in Africa handbook*, doc. Slow Food.

Slow Food Foundation for Biodiversity (2014), *10.000 gardens in Africa vademecum*, doc. Slow Food.

NEPAD, The African Union Commission (2014), CAADP: *Sustaining the momentum into the next decade Implementation report*, http://www.nepad-caadp.net/sites/default/files/ Sustaining_CAADP _Momentum_ Implementation_ Report_July_2012_0.

Dansero E., Peano C., Semita C. and Tecco N. (2012), *The Food Community Model in Slow Food's Action in Africa, Research Report*, Torino, CSA e CISAO

The World Bank News and Broadcast (October 1, 2008), http://go.worldbank.org/ U8PA182X20.

United Nations, Department of Economic and Social Affairs, Population Division (2015), *World Population Prospects: The 2015 Revision*, https://esa.un.org/unpd/ wpp/publications/files/key_ findings_wpp_2015.pdf

USDA (2008), *Food Security Assessment 2007, Agriculture and Trade Reports*. Washington D.C., https://www.ers.usda.gov/webdocs/publications/gfa20/9385_gfa20 _1_.pdf

ANOTHER WAY IS POSSIBLE

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*M**BUN

Abstract

Another way is possible. Another way of rearing and growing. Another way to relate ourselves with animals and nature, another way to feed ourselves and enjoy food.

This is the idea of M** BUN, simple but revolutionary: healthy products, local food ingredients, recycled or biodegradable materials, respect for people, for the environment and even for your rhythm.

MAC BUN is born in 2009 in Rivoli (TO) from the experience of the agricultural farm of Scaglia family which produces beef since 3 generations, with a particular attention for the Piemontese steer breed, certified by the Coalvi consortium, and Francesco Bianco, an entrepreneur from Turin.

In less than six years, two POS (point of sale) have opened in Turin, with altogether 80 employees.

Mac Bun is the first AGRIAMBURGERIA SLOW FASTFOOD, because it is an innovative project, that joins the bases of the agricultural world, respecting nature, and food service.

The term SLOWFASTFOOD, other than meaning "the right time", define also the rearing timing and the care for the preparation of raw materials, combining them with the concept of fast catering.

The MAC BUN's world, is based on 4 fundamental points:

- Build up something different
- The quality of the product is the focus point of the project
- Desire to experiment
- Change the concept of work and the relationship with the employees

1. Product quality at the center of the project

Our recipes have the flavor of our land which is inherent in all our ingredients.

To ensure the daily quality of the products we offer to our customers, as well as the strict controls both by ourselves and our suppliers, it is very important: seasonality.

Why is it so important? In our dishes is ensured the presence of seasonal ingredients in order to respect the natural time cycle.

Another very important aspect was the choice of avoiding the use of products that contain dyes and preservatives, while promoting the employment of fresh and not frozen materials.

Our "Friciulà", from Italian crops is strictly fresh: we do not use frozen ones or those pre-fried, in order to rediscover the genuine taste of potatoes. Vegetables are fresh, delivered the same day. Bread, sauces and beers are handcrafted. We offer products of high quality, and the food we serve helps to assist small local economy, making it seem even better.

Since the beginning our goal was to propose healthy food, controlled goods, reflecting their territories, and aiming at customers of all ages which have an interest in promoting our region and are aware of the necessity to respect the environment and the importance of the short chain.

Our beers, Mac Biunda and Mac Rusa are produced by a craft brewery in Lower Val di Susa using only ingredients of high level. Each month, in addition to these two types, we support other craft beer producers of the territory, to promote innovative aspects of our surroundings.

2. Why building something different?

With Mac Bun idea, we wanted to bring to the table the authenticity of the short chain products by proposing a type of food often perceived as "Junk Food". The goal is to promote a new way of breeding, cultivating, relating to nature by eating healthily. We consider ourselves ‘against’ the concept of speed and in favor instead of a slow and healthy approach, aimed at bringing unique moments and different tastes, with an eye on ecology, on environment and livestock.

In addition to meat, pivotal point of the project, we are committed to find other suppliers in the territories that support our concept of Slow Fast Food and to promote local food.

Year after year, we have increased our sensitivity and awareness, that led us to seek raw materials of higher and higher quality and this goes even beyond what the final outcome of the product is. Our suppliers respect our fundamental belief for which vegetables, rather than meat or bread, are grown or produced by following the respect of animal production, maturation and conservation. Particular attention is dedicated to the control of the production cycles.

For example, the Scaglia farm feed its animals with cereals and fodder grown in their fields, worked in the company for a proper diet and controlled by agronomists and experts. They are fed according to their needs, ensuring them an adequate space while maintaining high levels of cleaning and monitoring at each step of the process.

3. Desire to experiment something new

In a changing world it is not possible to stop: it is essential to experiment and continuously improve. Each particular of our idea has been carefully designed to ensure that in addition to the taste, there is a careful preparation, for example for the cooking process of meat.

For years our meat is cooked in special ovens of new concept: they reduce fumes (and therefore the impact on the environment), enhance taste and prevent the damaging process of carbonization, typical of grilling.

We are always looking for new materials to be in line with the environment: our forks and disposable cups are biodegradable, recyclable as damp. We have chosen to reduce wastes at every stage by minimizing packaging.

We have implemented a controlled recycling process to empower, and educate our customers to love their land, just as we do.

4. Changing the concept of work and relationship with employees

Our employees are the main actors of the project, without which, it could not exist. They are the last, not least important, phase of this chain. For us, they are not just employees, but people who interact directly with all the points of this idea. First of all, to make them aware and integral parts of this project is important to let them get in touch with a multitude of realities. We organize several trips to our suppliers, in which they can get in touch with production processes and products, taste them, so as to be fully prepared to serve our customers. In addition to these experiences, their work is integrated directly into the kitchen, sampling the various latest products or perfecting the dishes with their advice. Our training is mutual: they interact directly with their own ideas and experiences in the project. It is important to establish a rotation model of duties and tasks for our employees.

In addition to trips and meetings of training, TEAM WORKING is also very important to create direct relationships among our staff. It is a relationship made up of mutual respect and sense of belonging, not only from the professional, but also from a personal point of view. The harmony of the group helps everyone feel a fundamental part of an innovative idea.