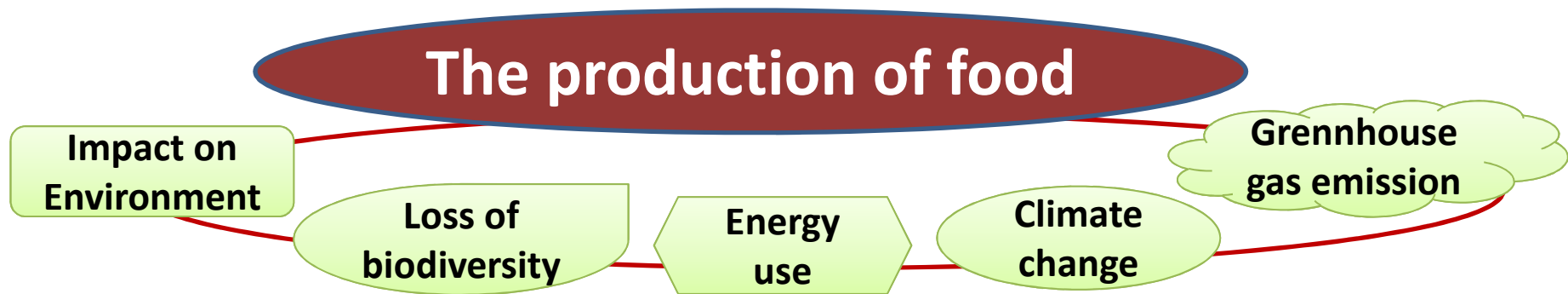




# The unbearable lightness of organic foods

**Stefano Di Marco**

**CNR-IBIMET, Via Gobetti 101, 40129 BOLOGNA, Italy**



**Paradox:** Agriculture is an “unnatural activity which perturbs the environment” focusing on a single species/product among many in the environment (Environmental Impacts of Modern Agriculture. Hester & Harrison. Royal Society of Chemistry, Cambridge, 2013)

“Although we believe agriculture has enabled us to lead lives of wealth, health and great longevity, **it led to the invention of more and better weapons, soldiers, warfare, class divisions...**” (Guns, Germs and Steel Agriculture, Jared Diamond, UCLA, 1997)

**Alternatives?** The average life expectancy for a hunter-gatherer pygmy in the Philippines was **19**. (Andrea Migliano, University College London, Anthropology)

The production of food takes considerable amounts of energy and contributes to the greenhouse gas emissions

Organic farming: a natural way to produce food

# Organic farming



Ecological production management system that promotes and enhances biodiversity, biological cycles and soil biological activity, excluding the use of synthetic fertilizers, pesticides, growth regulators, and livestock feed additives.

Organic systems rely upon crop rotations, animal manures, off farm organic wastes, mechanical cultivation, and biological control agents and natural compounds for the management of pests, diseases and weeds

**Do organic farming practices provide solutions to the resource efficiency and to the ecological food production challenge?**



# Before making a list of good and bad...

Assessment of activity of a compound to control a disease in organic and conventional farming

## Conventional

Synthetic pesticide activity:

it *is* or *is not* able to control a disease by «killing» the pathogen

## Organic

Biological control agent (*Trichoderma* spp.) activity:

it *is* or *is not* able to control a disease by «killing» the pathogen

Activity also can lead to an improvement of the plant as:

- 👉 growth and productive features
- 👉 water and mineral use efficiency
- 👉 resistance to stress
- 👉 product quality

**Holistic  
approach**



# Organic vs conventional


## *Organic milk*

 Reduction of CO<sub>2</sub> emissions

 Lower energy requirement

 Higher soil organic matter content

 Lower nutrient losses

 Absence or strong reduction of synthetic pesticide and fertilizer

 Increase methane emissions

 Higher land use

 Lower productivity

 Average operating costs

In some cases lower acidification (SO<sub>2</sub>) and eutrophication (PO<sub>4</sub>)

# Organic vs conventional

## *Organic milk*



Organic farms tend to have **lower** (per unit of field) or **higher** (per product unit) *impact* as nitrogen leaching, nitrous oxide and ammonia emissions



**High heterogeneity  
difficult to compare...**

Most of the studies demonstrated **lower environmental impacts from organic farming**: biodiversity, sustainability over the long term, **better soil**: fertility, erosion control, buffering-stability, carbon sequestration vs global warming

# Organic foods: are they safer? More nutritious?

Food security, nutritional quality and safety vary widely around the world

## Organic food

**France (Marsiglia University) "Organic agricultural systems produce food with high quality standards"**

- More dry matter and minerals (Fe, Mg)
- More anti-oxidant micronutrients
- More polyunsaturated fatty acids from organic animal products
- Less nitrates
- Similar levels of mycotoxins



**USA (Stanford University) "Limited evidence for the superiority of organic foods"**

- Higher levels of total phenols (highly heterogeneous)
- Omega-3 fatty acids from organic milk (highly heterogeneous)
- Any significant differences in the vitamin content
- Bacteria: higher risk for contamination but lower for resistance



**Italy (INRAN) "Organic products have higher nutritional value"**

- More phenolic compounds (anti-oxidant)
- More carotenoids
- More polyunsaturated fatty acids, and conjugated linoleic acid from organic animal products



94–100% of organic food does not contain **any** pesticide residues or additives



# Perception of organic food and taste education



Products were labeled as 'ORGANIC' and 'REGULAR' although they were identical and organically produced

Participants estimated those foods with organic labels to be lower in calories and with better nutritional evaluations (e.g., tastes lower in fat, higher in fiber), than those without the organic label



## EU promotes and supports organic farming

The European Food Information Council guide to food safety, quality and health & nutrition for a balanced diet and healthy lifestyle

Food education programs aimed at encouraging healthier and more sustainable food choices among children

**Italian schools go organic:** the Emilia Romagna region has implemented a law mandating a 100 percent organic diet for nursery and primary schools (from 3 months to 10 years) and at least 35 percent in advanced schools, universities, and hospitals.



## Conclusions...

- Although a lot of variables can play a role, organic productions generally show less environmental impacts in comparison with conventional farming
- The current farming system “produce” both hunger and obesity. Billion tons of edible food goes wasted
- Can organic farming feed us all?
  - Ethical-scientific disputes: GMO, “social Darwinism” as junk food for lower classes and organic food for an elite
  - Although overall organic yields are significantly lower than conventional yields, organic farming does have a role to play because under some conditions it does perform well (*Seufert et al., 2012*)  
Organic yields are on average 80% of conventional yields, but variation is substantial (*de Ponti et al. 2012*)
- Organic food is not only a group of techniques. It is typicality, territory, a set of attitudes about the land and about farmers' relationship with the land: **“Great resemblance between mental and bodily taste”** (*David Hume, Of the standard of taste, 18th century*)
- As for the Symposium of Plato or the Convivio of Dante Alighieri: we have to discuss around the table on **all** the opportunities to improve the sustainability of food productions in the global world



Thanks for your attention



Stefano Di Marco  
**[s.dimarco@ibimet.cnr.it](mailto:s.dimarco@ibimet.cnr.it)**