

## **A Quest for Sustainable Food Systems: Food Waste Matter**

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In the recent decades the sustainability of food systems has been under pressure due to a number of local and global deeply interrelated driving forces constantly evolving and raising new challenges. **Agrarian structures** are changing towards an increased agro-industrialization. Factors as improved technologies for food production and processing, more efficient distribution chains, more effective knowledge transfer, (foreign) capital investments contributed to a growth and a consolidation of agro-industrial processes that create opportunities for producing and exporting higher value crops. At the same time several questions remain regarding the role of small farmers in industrialization processes, the effects on nutrition and environment (da Silva A. C., 2009; Reardon T., Barrett C. B., 2000; Paarlberg R. L., 2013).

**Food demand** is increasing and **food consumption** is changing. In many rich countries, **obesity and the need for healthy diets** are now a public concern just as hunger. Global meat production and consumption have increased rapidly, with harmful effects on the environment, public health and economic systems. Large part of this growth of meat production and consumption is led by newly industrialized countries with China counting for over the 30% (OCED/FAO, 2015). At the same time many countries are calling for lower meat consumption and implements dedicated awareness campaigns and policy measures (Lang T., Heasman, M., 2004; Paarlberg R., 2013, Knickel et al., 2017).

The increase of global population and related demand for food, which is expected to increase by 70% by 2050 (FAO, 2012), will continue to create a pressure on **food security**. Currently about 793 million people are undernourished globally as UN reported in its Sustainable Development Goals, and about 10 million die of hunger or hunger-related diseases, **while around 1/3 of food produced is wasted** (Gustavsson J. et al, 2011). It is therefore urgent to address the food waste issue.

**International agri-food trade** has been characterized by a significant expansion in the past decades with relatively important structural changes in favor of developing countries that in some cases became important players. Global food commodities trade counts for more than US\$520 billion per year and would be enough to feed approximately two billion people (Ghosh B. N., Guven H. M., 2006; MacDonald G. K. et al., 2015).

**Food prices are increasingly unstable**. The international price shock of 2008 raised significant concerns on food prices increase and volatility and on the related effects on food security. In particular food price volatility can be taken as a measure of risk and uncertainty and therefore as a threat to food security (OCED/FAO, 2015; Kalkuhl M., 2016).

**The energy intensity** of modern food systems represents a crucial challenge in a scenario of decreasing oil resources, growing population, increasingly industrialized agriculture, uncertain biofuels policies (Pimentel D., Pimentel M.H., 2008; Cuéllar A.D.; Webber M.E., 2010; Vittuari M. et al. 2016).

**The intensity of the competition on natural resources** is growing generating an increasing burden on the environment, through impacts related to resource extraction, use and disposal (Garrett N., Piccinni A., 2012; Hartard S., Liebert W., 2015).

**The impact of climate change** in agriculture is growing negatively affecting both crop and livestock systems in most regions. At the same time the agricultural sector is a major emitter of greenhouse gas emission: 17% directly through agricultural activities and an additional 7% to 14% through land use changes (OCED, 2015).

Many regions are experiencing **increasing frequency and intensity of natural and man-made disasters**. Impacts present human and economic as well as environmental dimensions. At the same time human practices on agricultural systems and forestry can exacerbate the intensity of negative impacts (IPCC, 2014).

In 2015, in such a framework, the international community adopted a set of new goals to reinforce the fight against poverty and hunger. Sustainable Development Goal (SDG) number 12 aims at “Ensuring sustainable consumption and production patterns” and suggest an additional focus (SDG 12.3) on food waste: “By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses”. The introduction of this goal represents a formal recognition of food waste as a global priority (UN, 2015).

Food waste has a number of interrelated implications with the aforementioned challenges in terms of food security, human health, economic development and environmental impact. **From a life-cycle perspective**, food waste represents, beyond a missed opportunity to feed the growing world population, a huge pressure on the natural capital both in terms of natural resources consumption (e.g. energy, water, fish stocks, agricultural land), environmental pollution (water, air, soil) and biodiversity loss (Scherhauser S., et al., 2015). **From a behavioural perspective**, food waste can represent a failure of the rationality of the homo oeconomicus since its decisions are driven by a variety of diverse factors (exchanges of opinions, imitation, pro-environmental values, beliefs etc) that lead to a deviation from the predictions of standard economic theory.

Starting from the interrelated implications of food waste in the context of sustainable food systems this contribution wants to discuss a number of challenges related to food waste.

What is food waste? Does food waste harm natural resources? Is the reduction of food loss and waste an exaggerated agitation (Koester U., 2015) or does it represent a real treat to food system sustainability? What are the main causes of food waste? What are the determinants of consumer food waste behavior? What is the role of policy in this complex domain?

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