



Global Sustainability Transition Hinges on Food

What we eat and how much food we waste provide powerful levers for change

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On August 2nd humanity marked Earth Overshoot Day 2017, the date when humanity's annual demand on nature's renewable resources and services exceeded what Earth can regenerate over the entire year, according to Global Footprint Network, the research institute specialized in natural resource accounting that has developed the [Ecological Footprint metric](#).

The Ecological Footprint measures the land area that a given population requires to produce the natural resources it consumes (including plant-based food and fiber products, livestock and fish products, timber and other forest products, space for urban infrastructure) and to absorb its waste, especially carbon emissions. The Ecological Footprint tracks the use of six categories of productive surface areas: cropland, grazing land, fishing grounds, built-up land, forest area, and land to uptake carbon (known as carbon Footprint).

On the supply side, Global Footprint Network tracks resource availability through a metric called "biocapacity", which includes cropland, grazing land, forest land, fishing grounds, and built-up land. Footprint and biocapacity results are available for more than 200 countries and regions from 1961 to the present. These [resource accounts](#) draw primarily on United Nations data sets.

Human activity currently consumes as much renewable natural resources as that produced by 1.7 Earths, depleting natural capital, states the organization. Deforestation, drought, fresh-water scarcity, soil erosion, biodiversity loss, and the buildup of carbon dioxide in the atmosphere, can all be identified as costs of a global ecological overshoot.

Food security in question

National Ecological Footprints vary widely. The average Ecological Footprint per capita in high-income countries (as defined by the United Nations) is five times that in low-income countries, according to [Global Footprint Network data](#). One significant driver of the Ecological Footprint, however, can be observed everywhere: food demand.

The way in which most human societies across the planet produce and consume food plays a major role in the global ecological overshoot, as it contributes to 26% of the overall humanity's



Ecological Footprint. Furthermore, the impact of food on the global Ecological Footprint is currently on track to grow along a widely unsustainable trend.

While sustainable intensification is increasingly seen by many as a promising approach to food security and sustainability, a recent study has shown that it might be unfeasible to feed a growing population on the land currently available—even if sustainable and efficiently cultivated—without also increasing environmental pressures: [according to Davis and colleagues](#), projected land demand could increase, and exceed available land resources by up to 700% by 2050 (see “Meeting future food demand with current agricultural resources,” Davis et al., 2016).

Feeding people sustainably cannot be achieved through changes in production practices only. Food choices also need to evolve, since sustainable food production will unlikely be able to sustain current consumption practices from a growing worldwide population. Thus changes in production practices geared towards sustainability must be coupled with changes in consumption patterns towards sustainability.

Not all countries are equal today with regard to the weight of the food demand on their Ecological Footprint, however. In the sole Mediterranean region, for instance it ranges from 13% of the total Ecological Footprint in Slovenia to 51% in Morocco.

Food systems: Levers for change

The impact of the food system on the planet’s natural ecosystems is multi-faceted and complex. Consequently, the food system is replete with opportunities to invest in key drivers of a sustainability transition.

For starters, food production is at the forefront of a much-needed transformation. The industrialization of agriculture in the wake of the Second World War, and the strict focus on productivity that has been pushed by both public policies and market forces worldwide, have resulted in the severe depletion of natural ecosystems—including declining agricultural biodiversity and compromised soil health. In turn, yield growth is being jeopardized. Increasingly, crop land disappears as eroded topsoil expands, shrinking resource capacity.

Meanwhile, the globalization of the food system has impacted distribution, transforming food choices and even eating habits. Traditionally shaped by local climate, food availability and production as well as cultural traditions, food trends in many societies have been evolving towards an increasingly homogeneous diet that favors cheap imported commodities.

A recent [study](#) in the Mediterranean region has shown, for example, that all Mediterranean countries except France rely on the biocapacity of foreign countries to satisfy their residents' demand for food. This even though they may be exporters in certain food categories.



A major consequence of the food system globalization, and of rising living standards around the world in the past two decades, has been the stark increase in meat consumption, especially in [China](#). This constitutes a major driver of the global food Footprint increase, since the production of animal calories is significantly more resource-intensive than that of plant calories. For instance, it takes 14 times as much biologically productive land to produce 1 ton of beef as it takes to produce 1 ton of grain. Pork? 1.9 times as much.

Furthermore, global livestock is responsible for 9% of all anthropogenic carbon emissions. To put it bluntly, a balanced diet approach with lower meat consumption is a great way to reduce our Ecological Footprint, while also benefiting our health.

The Mediterranean region is no exception. Because of its scarce natural resources (e.g., water) and increasing climate-related impacts, it is becoming especially vulnerable to its population's food choices in favor of animal calories. The [study](#) led by Alessandro Galli ("Mediterranean countries' food consumption and sourcing patterns: An Ecological Footprint viewpoint," Galli et al., 2016) has indicated a tendency, among most countries in the Mediterranean region, to drift away from the typical Mediterranean diet, thus contributing to increased pressure on the planet. It found that countries such as Portugal and Malta, which have the highest food Footprint intensity of all countries in the region, are characterized by protein-intensive diets.

In particular, the authors stress that the reasons for Portugal's high value are fourfold:

1. overall high food consumption (people in Portugal consume up to 3518 kcal per person per day, or approximately 41% more than the FAO-recommended daily dietary energy requirement),
2. high proportion of products from the fish sector within the daily diet (contributing to 44% of the Portuguese food Footprint in 2010),
3. decreasing national fish landings (Baeta et al., 2009) balanced by increased imports (see FAO, Fisheries and Aquaculture Department, 2016) of fish commodities (contributing to an increase in the trade-embedded carbon Footprint) and
4. consumers' preference to eating high trophic level fishes such as the Atlantic cod and tuna (especially skipjack tuna), which place a high demand on the planet's marine primary production (Grunewald et al., 2015; Pauly and Christensen, 2002).

By analyzing the effect of shifting to a calorie-adequate diet or changing dietary patterns, the authors point out that the region's Ecological Footprint could be reduced by 8% to 10%.

The role of food waste



While much of the conversation about meeting the food needs of a rising population has been focusing on growing yields, a readily available and affordable solution with massive impact is finally beginning to emerge in the public debate thanks, in large part, to new programs by the UN Food & Agriculture Organization.

“If we reduce food waste and loss, we have more food available, without the need to produce more and putting less pressure on natural resources”, as José Graziano da Silva, FAO Director-General, pointed out at the launch of [this report](#) in 2013.

According to the FAO, more than 30% of food produced worldwide gets wasted, from unharvested crops rotting in the field, to poorly-handled goods spoiling in storage or in transit, to unsold inventories discarded as trash at selling points, to food surplus in restaurants and households’ kitchens. Fruits and vegetables, plus roots and tubers have the highest wastage rates of any food at 40-50%, although these foods should precisely provide the basis of a sustainable diet. Wastage and loss rates are 30% for cereals, 35% for fish, 20% for oil seeds, meat and dairy.

Industrialized and developing countries dissipate roughly the same quantities of food. In developing countries, wastage occurs mainly in the post-harvest phase due to lack of adequate infrastructure while, in developed countries, wastage occurs mainly at the retail and consumption levels, due to overly constraining regulations and unsustainable consumption patterns (Gustavsson et al. 2011). It has been estimated that reducing food wastage by half by 2050 would close one-quarter of the gap of food needs (Lipinski et al. 2013).

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Food waste is equivalent to 9% of the global Ecological Footprint. In the United States, an estimated 40% of the food goes to waste. That’s the equivalent of the total Ecological Footprint of Peru and Belgium combined.

In the context of its solution-focused Earth Overshoot Day campaign, Global Footprint Network recently calculated that cutting global food waste in half, as one target of the UN Sustainable Development Goal 12 on Sustainable Consumption and Production stipulates, would be significant enough to push the date of Earth Overshoot Day back by 11 days. It also found that shifting to a calories-adequate diet and reducing the resource-intensity of food consumption by increasing the share of cereals, vegetables and fruits in people’s diets (thus eating less protein-intensive food) worldwide could move Overshoot Day additional 31 days (see Figure 1). Overall, changing the way in which our societies eat and prevent food waste would have a fundamental impact on the global sustainability transition by moving Earth Overshoot Day by nearly 1.5 months.



This is no pipe dream. Many solutions to reduce the food Footprint are well known, readily available, and affordable. France is leading by example in this respect, according to a recent study by BCFN (Barilla Center for Food and Nutrition). Its Food Sustainability Index features France as a virtuous country, especially with regard to its public policy efforts to minimize food waste, its policy response to dietary patterns, and its people's purchasing power for fresh food.

Of note, [Beijing's goal of reducing China's meat consumption by 50% by 2030](#) would move Earth Overshoot Day by 1.5 days.

Staying on the current trajectory of renewable natural resources consumption, including food-production and consumption, will lead humanity to demand approximately 2.5 planets by 2050, or Earth Overshoot Day landing late May. Adopting more sustainable food production and consumption practices around the world, however, can yield high rewards. Including reducing humanity's Ecological Footprint by nearly 16%, and ushering humanity on a fast track to true sustainability.