



International 58th Meat Industry Conference “Meat Safety and Quality: Where it goes?”

## Meat production and consumption: Environmental consequences

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### Abstract

Meat production is projected to double by 2020 due to increased, per capita global consumption of meat and population growth. The livestock sector is one of the most significant contributors to urgent environmental problems. In Europe, food consumption is responsible for approximately 30% of total greenhouse gas (GHG) emissions. Meat generally has a considerably higher carbon footprint than plant-based food. This is especially true for beef, due to the emissions of methane (CH<sub>4</sub>) from enteric fermentation in ruminants.

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### 1. Introduction

The environmental impact of meat production varies because of the wide variety of agricultural practices employed around the world. Some of the environmental effects that have been associated with meat production are pollution through fossil fuel usage, and water and land consumption. Pre-farm production and transport of inputs to the farm, are most importantly feed and fertilisers, but also fuels, pesticides, growth substrates, pharmaceuticals, machinery, buildings and other capital goods; On-farm processes: soil emissions, emissions from enteric

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fermentation in animals, emissions from manure management, emissions from energy use on fields, in greenhouses, in animal houses; Post-farm processes: slaughtering, processing and packaging, storage and refrigeration, transport and distribution.

## 2. Global trends in overall meat consumption

According to a report from the Worldwatch Institute (WI), global meat production and consumption continues to rise (Fig. 1a). Meat production has tripled over the last four decades and increased 20 percent in just the last 10 years. Industrial countries are consuming growing amounts of meat, nearly double the quantity in developing countries.

World beef production is increasing at a rate of about 1 percent a year, in part because of population growth but also because of greater per capita demand in many countries (Fig. 1b). The largest fraction of the greenhouse effect from beef production comes from the loss of carbon-dioxide (CO<sub>2</sub>) absorbing trees, grasses and other year-round plant cover on land where the feed crops are grown and harvested. Second most important is the methane (CH<sub>4</sub>) given off by animal waste and by the animals themselves as they digest their food<sup>1</sup>.

When considering the future of sustainability, the outline of the food system is a critical aspect. An understanding of the factors that influence meat and fish consumption is important for developing a sustainable food production and distribution system<sup>2</sup>. This is especially the case because the importance of the food system as a driver of global environmental change can be expected to increase<sup>3</sup>. National dietary patterns not only have ecological and economic development contexts, but also a regional/cultural context. Food consumption patterns, particularly meat and fish consumption, have serious consequences for environmental sustainability<sup>4,5</sup>.

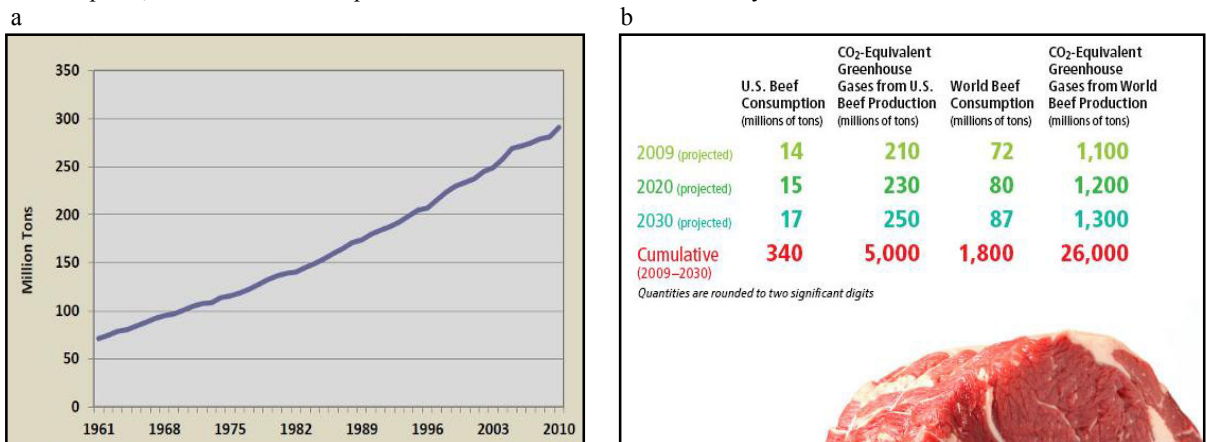


Fig. 1. (a) World Meat Production 1961-2010<sup>6</sup>; (b) World Beef Production<sup>7</sup>.

## 3. Livestock and methane emissions

Beef and dairy farming operations produce the greatest amount of CH<sub>4</sub> from human-related activities<sup>8</sup>, so methane generated by ruminant production systems and its effects on global climate change is a cause for concern worldwide<sup>9</sup>. In the United States, CH<sub>4</sub> comprised 14% of the total greenhouse gas 6 emitted in 2007 and 7% of this methane was due to agriculture<sup>10</sup>. In an analysis of the EU-27 countries, beef had by far the highest GHG emissions with 22.6kg CO<sub>2</sub>-eq/kg<sup>11</sup>. The consumption of meat, dairy and eggs is increasing worldwide<sup>12</sup>, and this will aggravate the environmental impact related to livestock production<sup>13</sup>.

Human dietary changes could produce a cascade of effects, through reduced production of livestock and manure, lower feed demand, resulting in lower nitrogen (N) and greenhouse gas (GHG) emissions, and freeing up agricultural land for other purposes<sup>13</sup>. Cultured meat (i.e., meat produced in vitro using tissue engineering techniques) is being developed as a potentially healthier and more efficient alternative to conventional meat. In

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