# Chapter 30
# The Greenhouse Gas Emissions of Various Dietary Practices and Intervention Possibilities to Reduce This Impact

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## ABSTRACT

*This chapter examines the link between dietary choices and greenhouse gas (GHG) emissions and possible interventions to reduce this impact. The connections between climate change, food systems and public health are explored. It is shown that there is variance in the impact of different food types on GHG emissions, with animal products having the greatest impact. The role of food system activities in the production of GHG emissions is also explored. Dietary choices and GHG emissions are examined using case studies from a variety of countries. Results show that reduced animal food production has increased potential to reduce GHG emissions compared to technological mitigation or increased productivity measures. Finally, a systems science approach is used to explore possible interventions aimed at reducing consumption of animal products.*

## INTRODUCTION

Climate change is now acknowledged as a significant public health issue and its impact on food security has become a major concern (AIWH, 2008; McMichael, Powles, Butler & Uauy, 2007). The links between climate change, food supply systems and dietary choices are complex (Sulda, Coveney & Bentley, 2010), and with a growing population, the global food system (comprising agriculture, food processing,

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distribution, retail and consumption) is predicted to experience an unparalleled number of converging pressures in coming decades (Pearson, Friel & Lawrence, 2014). In response to the global increase in population growth, food production in the second half of the 20th century more than doubled (Kahn & Hanjra, 2009). This has resulted in changes to climate systems, loss of biodiversity, degradation of land, and increased resource inputs placing unprecedented demands on the food system (Ericksen, Ingram & Liverman, 2009). A large amount of natural resources (land, minerals, water, energy) are used for food production and consumption, which generates significant emissions of greenhouse gases (GHGs) (Elferink, Nonhebel & Moll, 2008). Projected variability in climate systems without sufficient mitigation strategies to address climate change, anticipated loss of agricultural productivity, pasture growth and livestock production, as well as increased costs for agricultural production will influence trade patterns and have substantial consequences for global agricultural production (Gunasekera, Tulloh, Ford & Heyhoe, 2008). Such effects on the food system foresee long-term impacts on both the environment and public health, with increasing difficulty in achieving food security (McMichael et al., 2007).

As climate change affects diet and nutritional status, so too do dietary choices and food systems effect levels of GHG emissions, and consequently climate change. The level of GHG emissions from food production has been shown to be on par with levels produced by the transport sector, with the latter frequently viewed as a major GHG contributor (Garnett, 2009). A regional analysis for Europe found that food accounts for 31% of the EU-25's total GHG impact (Tukker et al., 2006), and studies from developed countries show that food consumption contributes between 15% and 28% to overall national GHG emissions (Garnett, 2011). This chapter explores how dietary choices impact on climate change by reviewing case studies from countries with diverse food cultures and habits. It then examines possible intervention approaches to shift dietary practice, particularly reduced meat consumption, from a systems thinking perspective.

## BACKGROUND

### Food Type and GHG Emissions

The type of food produced, animal-based or plant-based, has a large influence on GHG emission levels. Raising livestock in particular, is GHG intensive and responsible for approximately half of all food-generated GHGs. Ripple et al. (2014) reported that the livestock sector accounts for approximately 14.5% of all anthropogenic GHG emissions worldwide, with ruminant production (mainly cattle and sheep) the largest source of anthropogenic methane, contributing more than monogastric livestock (pigs) (Friel, Barosh & Lawrence, 2013). In addition to the methane released by enteric fermentation and dung, other gases that contribute to the overall level of GHG emissions are carbon dioxide and nitrous oxide from agricultural soil, and fertiliser production and use (Risku-Norja, Kurppa & Helenius, 2009).

The dairy industry also contributes to GHG emissions with approximately 85% occurring at the primary production stage (mostly methane). The emission levels increase as the degree of processing increases, with yoghurt and cheese production yielding 1.4 and 5.7 times, respectively, the amount of GHGs produced by milk production (Bradbear & Friel, 2011). On a weight basis, less emissions are generated from the production of vegetables and grains than from animal-based foods, and these generally stem from the power used for irrigation, processing and packaging (Friel et al., 2013).