CHAPTER 1

Introduction

Abstract Climate change poses a severe and growing threat to food security around the world. Our food is also a major driver of climate change. Here we provide an overview of these intertwined global challenges and the current state of progress (or lack thereof) in addressing them. We introduce the concept of climate-smart food, whereby climate resilience and productivity are increased while greenhouse gas emissions are simultaneously reduced. Finally, we map out the specific foods to be explored in-depth, from farm, vineyard or ocean to Scottish dinner table.

Keywords Paris Agreement • 1.5 degrees • Food security • Food waste • Malnutrition • Carbon footprint • Food miles

Time is against us. The world has already warmed by an average of 1 degree Celsius, as decades of rising greenhouse gas emissions have accumulated in our atmosphere. Devastating impacts are predicted if we fail to hold average warming well below 2 degrees Celsius this century. Any delay in tackling climate change, even one that allows the seemingly minor upward creep in the mercury from 1.5 to 2 degrees Celsius, will intensify droughts and floods, expose hundreds of millions more people to heat waves and risk complete destruction of the world's tropical coral reefs [1]. Sleepwalk into the steeper twenty-first-century warming pathways of 3, 4

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or even 5 degrees Celsius and the climate change threats becomes existential to civilisation itself [2].

The Paris Climate Agreement—a framework in which all nations can commit to and then implement climate action [3]—is the best game in town for steering us away from such Hollywood-fodder futures. So far though, the political rhetoric on urgent action does not match reality.

Current Paris commitments would still mean warming of about 3 degrees Celsius, and we are fast eating through our remaining 'safe' emissions budget [4]; metaphorically, in continued fossil fuel burning, and quite literally, through our food. Each carrot and tomato, burger and chicken drumstick, every food has a carbon footprint and feeding us all requires an awful lot of it. Even if (and it's still a big if) we manage to radically cut global fossil fuel use in the next decade, rising emissions from agriculture could slam the door shut on our chances for a safer climate future.

The world's food system is now responsible for over a quarter of greenhouse gas emissions [5]. Population is set to rise to around ten billion by the middle of the century at the same time as droughts, floods, heat waves and disease increasingly threaten food security. Feeding everyone well without blowing the climate budget represents one of the biggest challenges our society has ever faced. Signs are we're not match fit.

One in nine people alive today don't have enough to eat, while two billion of us consume too much [6]. Western diets have become much more calorie and meat intensive [7], ramping up emissions and damaging the health of both humans and the planetary systems we all depend on [6]. At the same time a billion people are lacking enough protein, one-third of children under five are stunted and some two billion people suffer from micronutrient deficiencies [8]. Tragically, around a quarter of all the food produced for human consumption doesn't even get eaten [9]. At an annual cost of nearly $1 trillion, global food loss and waste accounts for an estimated 8 per cent of total greenhouse gas emissions—if wasted food were a country it would come behind only China and the US in the list of biggest emitters on the planet [10].

Over the last decade the idea of Climate-Smart Agriculture—where these two Hitchcockian birds of food insecurity and climate change are hit with one stone—has grown apace. Led by the United Nations' Food & Agriculture Organisation it has developed from a few small-scale pilot farms into a global powerhouse of research, capacity-building and sharing of good practice on how food systems can become more productive, more resilient to climate change *and* lower carbon all at the same time [11].

Sitting hungrily at the receiving end of those food systems are the consumers: us. We are each connected to hundreds, maybe thousands, of other people and places through what we eat every day. We are connected to their soil, water and climate too. This book traces just a few threads in the tangled global web that is food and climate change—those of one day's food and drink for my family. Today's menu, from breakfast through to dinner, is a special one:

Climate-Smart Food

Breakfast
Orange Juice
Toast
Tea & Milk

Break Time
Chocolate Bar
Banana
Coffee

Lunch
Chicken Curry and Rice
Bag of Nachos

Dinner
Fish and Chips
Champagne

Some things on the menu—like tea and coffee, bread and chocolate—are regulars for most of us. Some, especially the expensive champagne with

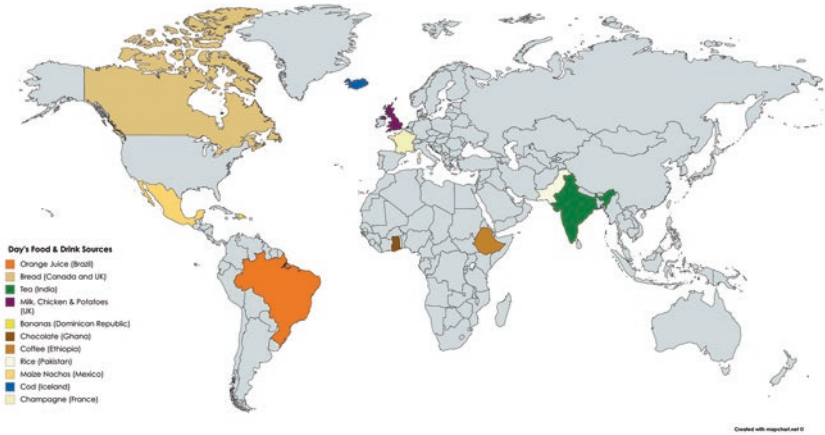

Fig. 1.1 Source countries for our day's food (created using mapchart.net)

dinner, are a very rare treat. Between them their stories span five continents and many nations. They are testament to the global nature of what we consume and its global exposure to the impacts of climate change. Unless your name is Lily Bollinger, some of your own daily food and drink will undoubtedly be different. Your tea might come from China instead of India, and your orange juice may be American not Brazilian. For milk or chicken, you may well have already made the switch to plant- and fungi-based substitutes. As such, the precise carbon footprints[1] will vary and the best climate-smart responses change (as we will see, local context is king) (Fig. 1.1).

The 13 foods and drinks explored here are inevitably a tiny Scotland-centred snap shot of the behemoth that is our global food system and its tumultuous relationship with climate. Each is followed back from our scuffed West Lothian dinner table to the field, barn or ocean waters that it

[1] Here, and throughout the book, the 'carbon footprint' is the amount of greenhouse gas emitted per unit of a particular food—the emissions per tonne of wheat, for example, or per glass of orange juice. Unless otherwise stated, all figures stated represent emissions of 'carbon dioxide equivalents' (or CO_2e). The CO_2e metric includes and standardises emissions of non-carbon dioxide greenhouse gases, like methane and nitrous oxide. It accounts for their differing lifetimes in the atmosphere and different 'radiative forcing' (warming) properties so, for example, 1 tonne of nitrous oxide emissions has about 300 times the warming effect of 1 tonne of carbon dioxide, and so would appear as 300 tonnes of CO_2e.

originally came from. We'll explore their carbon footprints, the extreme weather events they have endured and the climate threats they face in the coming decades. Crucially, we'll look at how climate-smart solutions could alter this future: whether such magic win-win-wins for food security, livelihoods and climate change even exist and, if so, whether we as consumers can help deliver them. Let's see.

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