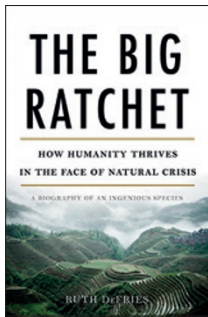


# Wringing food from the world



The Big Ratchet:  
How Humanity  
Thrives in the Face  
of Natural Crisis

by Ruth DeFries

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The spectre of a rapidly growing human population leading to famine and the consequent decimation of the human species has been feared for centuries. In 1798, the English reverend Thomas Malthus brought this threat to the forefront of public consciousness when he wrote “the power of population is indefinitely greater than the power in the earth to produce subsistence for man.” The world survived the doomsday prediction and prospered, yet periodic prophecies of doom have followed humankind over the centuries, more recently in Paul Elrich’s *Population Bomb* (1968), and the Club of Rome’s *Limits to Growth* (1972). At the time of Malthus, the world population was less than a billion; when Paul Elrich wrote *Population Bomb*, it was 2.5 billion. Today it is 7.1 billion.

In *The Big Ratchet*, Ruth DeFries provides a compelling story of how humans overcame resource barriers, provided for their sustenance, and, yes, prospered. This story extends to the early time of our hunter-gatherer ancestors, through the rise of sedentary farmers growing staple grains such as rice, wheat and maize, to today’s high concentrations of urban dwellers. DeFries shows us that at every point in our history, humanity has marshalled nature to feed its growing numbers. She takes us on a fascinating journey through our past and describes how we used knowledge accumulated over generations and technological innovations to smash through bottlenecks and increase food supplies for a rising and urbanizing population. The underlying message of the book whenever it seemed like population growth would outstrip our ability to feed ourselves, we

have come up with what DeFries calls “a new pivot”: a new way to use nature’s endowments to “ratchet food supplies to support a larger population.” That is, at least until the next “hatchet”, the next big threat, to our food system is encountered.

The book describes how societies are constantly innovating to enhance agricultural productivity to meet rising food demand. A case in point is the evolving management of soil fertility — as we disrupt nature’s recycling system by removing nutrients in harvested crops that would otherwise be returned to the soil, humans have had to find other ways to make sure agricultural soils remain productive. Shifting cultivation, in which land is temporarily cleared and cultivated and then allowed to revert to its natural state, arose over 9,000 years ago. As population growth and urban demand increased the pressure to produce more food from limited land resources, humans began to use animal manure and rotate crops with nitrogen-fixing legumes. When the costs of getting sufficient manure to the soil were becoming insurmountable, the opening up of the Americas and the export of guano (centuries-old deposits of bird droppings rich in nitrogen and phosphorus) provided a new pivot. Then, as guano deposits became depleted and population continued to grow, chemistry and the industrial revolution provided a new pivot in the advent of the Haber–Bosch process, by which ammonium fertilizer is produced under conditions of high temperature and pressure.

Trade in food also played an enormously important role in averting food shortages. It helped bridge resource scarcities, and support growing populations in low-resource environments. For example, trade could bring water-intensive foods such as apples, maize, or meat to parts of the world without enough water to grow them. The transfer of genetic innovations and information on improved agricultural management across borders triggered a period known as the Green Revolution in the early 1970s, when wheat and rice production increased rapidly in Asia and Latin America. The expansion of food variety, but also the emerging global

homogenization of diets, is also enabled by expanding food and agricultural trade.

While the storyline of the book is our ability to transcend adversity, Ruth DeFries does not shy away from presenting the negative consequences of food supply systems. She talks about the human health consequences of inexpensive, calorie-dense foods and the environmental costs of intensive agriculture: climate impacts from greenhouse gas emissions, disruptions of the planet’s nutrient and water cycles, and declining biodiversity. These are threats not just to terrestrial, marine, and aquatic environments: they could adversely affect our future ability to feed a world of 9 billion people, and hence the spectre of doom rises once again.

Ruth DeFries is in no way complacent about future threats to our food systems and our ability to overcome them. “The planetary hatchets from the Big Ratchet are poised to fall. New pivots enabling us to sidestep the blow are far from assured. Countries do not agree on a set of common goals. Humans have a proclivity to favor diets that extract a large cost on the planet. These problems do not make for easy solutions. If the past is a guide to the future, we may be able to muddle through from ratchet to hatchet to pivot and back, propelled by our human ingenuity. But whether the massive changes wrought by the Big Ratchet will have a very different ending from the events of the past remains to be seen.”

*The Big Ratchet* is a well-researched and highly readable account of how we came to be a “world dominating urban species”, and the opportunities and threats we will face in feeding a world of 9 billion people with only a small minority living in rural areas. For those who have deep concerns about our ability to meet future food needs, this book provides at least some reassurance that we have done it before. □

## REVIEWED BY PRABHU PINGALI

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