

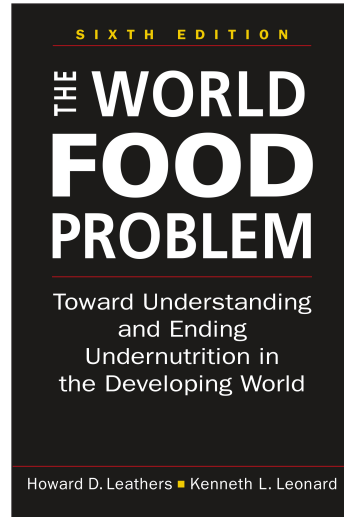
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The World Food Problem:  
Toward Understanding and  
Ending Undernutrition in  
the Developing World

SIXTH EDITION

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# 1

## Introduction

*While my grandmother was growing up in Vietnam, there was never enough food to eat. Adults would tell children to stop running around or they'd get hungry.*

—Kaili Nakanishi, undergraduate student  
at the University of Maryland

“At that time, grain was even more precious than gold,” Mr. Yuan told China Daily in a 2011 interview. “I never had a full stomach during that period, and that bitter memory is unforgettable.” Mr. Yuan said he saw at least five people who had collapsed on the side of the road, dead from starvation.

In the early 1970s, Mr. Yuan and his team developed hybrid strains that typically yielded 20 percent more rice than conventional varieties, transforming Chinese agriculture. . . . Rather than limit his rice technology and growing techniques to China, Mr. Yuan pushed to share them with the world. He ultimately partnered with the United Nations and the International Rice Research Institute in the Philippines, in addition to teaching farmers in India, Vietnam and elsewhere how to grow hybrid rice. In 2004, he was awarded the World Food Prize with rice researcher Monty Jones of Sierra Leone, and credited with helping “create a more abundant food supply and more stable world.” (Smith 2021)

**THE WORLD PAYS ATTENTION TO DRAMATIC AND PHOTOGRAPHED OR VIDEOED** events, but not so much to the quiet daily suffering of vast numbers of people. Hunger is one of the quiet forms of suffering, quiet to those of us who do not have to suffer, but painful and destructive to those who do suffer.

This book gives a voice to the people who suffer from hunger and tells the story of the great multitudes of people—mothers, fathers, neighbors, farmers, researchers like plant scientists and economists, and even political leaders—who have dedicated their lives to ending this suffering. As a result of their efforts, the progress made

during the past six decades has been remarkable—about 40 percent of the world’s population suffered from undernutrition in the 1960s; in 2019 that number was close to 8 percent. And it is not inconceivable that the progress will continue.

Despite this progress, heart-wrenching problems of undernutrition remain. This book is about eliminating hunger, specifically, how the world managed to feed so many more people even as the population expanded and what we would need to do to complete the job.

## **What Is Hunger?**

The word *hunger* captures everything from the sensation that one is ready to eat up to the real event of death by starvation. You have probably experienced the sense of hunger that is anticipation about the next meal, and you may have experienced the sensation in the body that energy is lacking. And, if you have fasted or been unlucky, you may have experienced the real loss of energy from having missed multiple meals. The sensation of having missed multiple meals and the stress that comes from worrying about avoiding or recovering from such a sensation is a real problem even in the richest countries in the world. The quest for adequate food causes severe psychological distress and disrupts the schooling of children in poor families even in wealthy countries. This hunger is real and is important.

However, this book addresses hunger that is even more severe. In many countries of the world, the lack of energy that results from regularly missing meals is a chronic problem—inadequate food for months even years at a stretch. This type of hunger robs people of the energy they need to work (work that might allow them to earn the food they need), denies them the nutrients needed to build a healthy and disease-resistant body, and robs their body of the stores of food that would allow them to survive an acute shortage of food. Chronically hungry people suffer the effects of inadequate nutrition and are also much more likely to die of other illnesses. These chronic shortages can turn to even more severe shortages and then people begin to die of starvation.

How many people suffer from these types of hunger? Since they happen quietly, we must rely on estimates to get a sense of the scale.

## ***Famine and Starvation***

Images in the media of families migrating in search of food or babies with bloated bellies and bodies too weak to sit up have flooded our consciousness with the horror of hunger. Each decade produces its own horror stories. Famine in North Korea reached such an acute stage in late 1997 that there were reports of people eating grass and tree bark. Southern Africa was the focus of an international effort to

avoid widespread death from famine in 2002. In 2015, the tragedy of refugees from Syria and the Sudan leapt into newspaper headlines and political debates.

When a person dies of hunger, what happens? Describing famine-related death, an anonymous author writing for *Time* magazine put it eloquently and succinctly:

The victim of starvation burns up his own body fats, muscles, and tissues for fuel. His body quite literally consumes itself and deteriorates rapidly. The kidneys, liver, and endocrine system often cease to function properly. A shortage of carbohydrates, which play a vital role in brain chemistry, affects the mind. Lassitude and confusion set in, so that starvation victims often seem unaware of their plight. The body's defenses drop; disease kills most famine victims before they have time to starve to death. An individual begins to starve when he has lost about a third of his normal body weight. Once this loss exceeds 40 percent, death is almost inevitable. (Anonymous 1974:68)

Approximately 50,000 people die every year from starvation in famines—the near complete absence of food (<https://ourworldindata.org/famines>). About 200,000 people die every year of undernutrition—the chronic shortage of protein or calories (<http://ghdx.healthdata.org>). (This number includes the 50,000 who die in famine as well as those who die of lack of food in other conditions.)

### *The Quiet Deaths from Hunger*

Although the drama of famine tends to capture our attention, most hunger-related death and suffering does not occur in famines. They happen daily—quietly and largely unchronicled—all around the world.

How do people die of hunger indirectly? Consider this common scenario, played out again and again in developing countries: a loving but poorly educated, poverty-stricken mother with several children. Food is scarce. Her youngest child has not grown for months because of undernourishment, and the baby's resistance to disease has fallen to a very low level. The family's supply of water is unsanitary. The older members of the family can handle the microorganisms in the water, but the baby develops diarrhea. He loses interest in eating. He seems more willing to take liquids, so the mother removes solids from his diet. Because liquids cannot provide enough nourishment to conquer his illness, the diarrhea continues. Although his mother continues to feed him and give him water, diarrhea means that the food does not provide enough nourishment and he continues to get sicker. By now, the boy is feverish, and limiting liquids accelerates the baby's loss of fluids. Severe dehydration follows, with death not far behind.

While adults do die of hunger during times of famine, most hunger-related deaths, whether from famine or from chronic undernutrition, occur among preschoolers. Pregnant and lactating women are also at substantial risk, although less so than

children. Malnutrition in children takes many forms. Undernourished children may be crippled by vitamin D deficiency, blinded by vitamin A deficiency, or stunted by protein deficiency. But the most common form of child undernutrition results simply from a lack of sufficient calories, with disease and death too often the result.

Between 7 and 9 million people die every year from causes related to hunger (of which we will learn more in later chapters) and the United Nations International Children’s Emergency Fund estimates that about 3.1 million children die from causes related to hunger every year; one death every ten seconds.

### *The Quiet Suffering from Hunger*

Finally, it is important to remember that many people suffer from hunger even if they do not die from it. It is estimated that almost 800 million people suffer the physical effects of inadequate nutrition. Hunger makes adults less able to do work, it makes it harder for children to grow into strong healthy adults, it makes it harder for children to learn in school, and, importantly, it causes direct suffering. Mr. Yuan suffered from hunger and saw people dying, unnoticed by the international community. The student’s grandmother was discouraged from playing too vigorously. We know their stories because they managed to escape, through education and migration, but most children do not escape. They live lives permanently altered by the hunger they suffered in childhood, robbed of their fullest potential.

### **This Book**

The purpose of this book is to provide a general introduction to the world food problem, its causes, and possible ways of addressing it. Our intention is to encourage the reader to be objective and analytical. At many points, the solutions may seem obvious; just give people more food, for example. It is instructive to keep these intuitive responses in mind as you advance through the book because the response to important consequential problems should never be “this is too hard.” At the same time, we hope you recognize that it *is* hard. It took a lifetime of work for Mr. Yuan to make a difference and he didn’t do it by giving sandwiches to the poor, he did it by years of painstaking research including “looking through tens of thousands of ears of rice, often while walking barefoot through the paddy field” (Smith 2021).

### *Understanding Hunger and Its Causes and Implications*

Part 1 of this book presents some factual background. What is undernutrition? How does being undernourished affect a person? How can we determine whether a per-

son is malnourished? What do we know about the extent of undernutrition in different periods of time and in different geographical areas?

### *Factors Influencing Food Supply and Demand in the Future*

Part 2 deals with factors that influence the extent of undernutrition. The framework we use to outline these factors is the framework of economics: supply and demand. As we look to the future, global quality of life will hinge on whether world food supply grows faster or slower than world food demand. If supply grows more rapidly than demand, average quality of life in the world will almost certainly improve—food prices will fall, making it easier for poor people to afford an adequate diet and freeing up income for the rich to spend on other goods and amenities. Similarly, if demand outpaces supply, quality of life is likely to deteriorate.

In analyzing prospects for food supply and demand, there are four particularly critical factors, which we refer to as the four Ps:

- Population
- Prosperity
- Pollution (or environmental resource quality)
- Productivity in agriculture

The impact of population growth on food demand is obvious. More mouths to feed mean more demand for food.

Widespread economic prosperity means that more people can afford adequate diets and that people are more likely to have access to healthcare, a sanitary water supply, and education. Income levels also affect food demand—as people attain higher income levels, they tend to buy more food and a wider variety of it, including meat and animal products. So, 7 billion relatively affluent people require significantly more agricultural production than do 7 billion relatively poor people.

Pollution, environmental quality, and the availability of land and water resources needed for agricultural production are critical factors in analyzing the future of agricultural production. To what extent can a population expand the area it devotes to agricultural production? Will soil erosion or water pollution result in land that is less arable or less irrigable? How will global climate change affect agricultural production?

Agricultural productivity refers to the amount of food produced on a given area of agricultural land. Regardless of environmental quality and land and water resources, the food supply will continue to grow if productivity grows quickly enough. Productivity per acre may increase when farmers apply more fertilizer or



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use more labor. Productivity can also increase because of new technology, such as new seed varieties.

Population, prosperity, pollution, and productivity interact with each other in complex ways. Some examples of these interactions:

- As population grows, urban and industrial water users compete with agriculture for scarce water.
- Population growth slows as people become more prosperous.
- As agricultural productivity increases, economic prosperity improves for the entire economy.
- Increased use of agricultural chemicals may improve productivity while harming the environment.

Government policies can influence the long-term supply-and-demand balance of food. However, the complexity of these interactions illustrates how difficult it can be to decide among various policy alternatives. Appropriate policy changes are the subject of the last part of this book.

### *The Main Nutrition Policy Alternatives*

Part 3 of the book focuses on policy interventions that may help alleviate the world hunger problem. For the most part, the policy interventions we examine are aimed at the factors identified in Part 2. Undernutrition can be reduced by increasing hungry people's access to food.

The most important actions a government can take to alleviate malnutrition are to promote general economic growth and to promote agricultural research. These contribute significantly to a second tier of government objectives: reducing population growth and maintaining or improving natural resource quality. Governments have repeatedly attempted to address the world food problem by regulating prices or by redistributing food between rich and poor countries or by food distribution programs aimed at the poor but have been largely unsuccessful.

Part 4 then provides an analytical framework for looking into the future. What are reasonable assumptions about the underlying forces influencing the extent of world hunger? What might the world food problem look like in the year 2050?