



Feeding the World after 2050

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Projections of food demand through the middle of this century, when the world's population will be between 9.0 and 9.5 billion, are widely circulated, not least in television advertisements. After reviewing these projections, I discuss demand trends after 2050. Special attention is given to Sub-Saharan Africa, where the threat of food insecurity will be much more severe than anywhere else in the world.

Food demand trends up to 2050 for wealthy nations:

- Current combined population: 1.3 billion (out of 7.2 billion for the world as a whole).
- Total fertility rates (TFRs) fell to or below the replacement level (2.1 births per woman) at least a generation ago and now average 1.7 births per woman. Natural increase (i.e., births minus deaths) has ended or will do so soon, although population growth is still possible because of immigration.
- Standards of living are high enough for food demand to be relatively insensitive to additional income growth.
- Bottom Line: Modest increases in food demand for the foreseeable future.

Food demand trends up to 2050 for emerging economies:

- Current combined population: 5.0 billion (out of 7.2 billion throughout the world).
- TFRs now average 2.4 births per woman and have fallen to or below the replacement level in many countries. There is still natural increase, although human numbers will peak and then decline – first in China (around 2030) and then in Thailand, Vietnam, Iran, Brazil, etc. Russia's population is already contracting.
- Improved living standards, which are substantial in these economies, are now the primary driver of the growth in food demand.
- Bottom Line: Substantial increases in food demand during the next few decades.

Food demand trends up to 2050 for the world's least developed countries (LDCs):

- Current combined population: 0.9 billion (out of 7.2 billion) in four dozen countries, primarily in Sub-Saharan Africa.
- In spite of recent declines, TFRs remain well above the replacement level, averaging 4.5 births per woman. Natural increase is elevated and will continue to be so well after the middle of this century.
- Food demand is sensitive to higher earnings in the LDCs, but income growth is modest.
- Bottom Line: Rapid demographically-driven growth in food demand well past 2050.

Longer term trends in food demand for wealthy nations:

- With immigration compensating for negative natural increase, the combined population of these nations in 2100 will be little changed from what it is today: 1.3 billion.
- Between their own production and the imports made possible by non-agricultural exports, wealthy countries will feed themselves with ease.

Longer term trends in food demand for emerging economies:

- After peaking around 2050, the combined population of China, India, etc. (currently 5.0 billion) in 2100 will be 6.5 billion (out of 10.8 billion for the world as a whole).
- Food insecurity could be severe in selected portions of some emerging economies – northern India, for example, which suffers from bottom billion realities (including elevated TFRs) and where water resources are severely depleted already. But otherwise, the emerging economies will feed themselves out of domestic production and imports paid for with non-agricultural exports.

Longer term trends in food demand for LDCs:

- Bottom billion LDCs will not experience any demographic contraction this century. To the contrary, their combined population will triple, from 0.9 billion at present to 2.9 billion (out of a global total of 10.8 billion) in 2100.
- Food insecurity is widespread already in LDCs. A minority of these countries rely heavily on non-agricultural exports: crude oil, copper, and other commodities rather than manufactured goods. Barring a quantum leap in food aid, food supplies will have to be produced domestically.

African agricultural development – environmental challenges:

- Annual precipitation in the tropics and subtropics tends to be concentrated in a single wet season, which lasts several weeks or a few months and during which most rain falls in driving storms. Soil erosion is consequently elevated.
- Aside from places with recent volcanic activity (around the Great Lakes of East Africa, for instance), soils are of ancient geologic origin and therefore heavily weathered and infertile.

The Green Revolution south of the Sahara:

- Thanks to agricultural R&D sponsored originally by the Rockefeller and Ford Foundations and dating back to the 1940s, farmers adopted new varieties of rice and wheat starting in the middle 1960s. These new varieties responded to increased irrigation and fertilization and featured much higher yields.
- Due to misguided government policies and for various reasons, this Green Revolution, which saved countless Asians from starvation, never took root south of the Sahara.

Doubly Green Revolution:

- Gordon Conway – a past president of the Rockefeller Foundation (an original supporter of the Green Revolution) – has called for a major push to increase agricultural output in areas with elevated food insecurity, though now with more attention paid to the conservation of soil, water, and other environmental resources.
- Different from some self-styled advocates of sustainable agriculture, Conway does not oppose the use of inorganic fertilizer and other chemical inputs, which African farmers rarely use. Neither does he reject agricultural biotechnology.
- The application of biotechnology will grow imperative in Africa, especially if climate change coincides with growth in food demand.