



[Scientific American Magazine](#) - January 27, 2010

Fixing the Global Nitrogen Problem

Humanity depends on nitrogen to fertilize croplands, but growing global use is damaging the environment and threatening human health. How can we chart a more sustainable path?

By Alan R. Townsend and Robert W. Howarth

Billions of people today owe their lives to a single discovery now a century old. In 1909 German chemist Fritz Haber of the University of Karlsruhe figured out a way to transform nitrogen gas—which is abundant in the atmosphere but nonreactive and thus unavailable to most living organisms—into ammonia, the active ingredient in synthetic fertilizer. The world's ability to grow food exploded 20 years later, when fellow German scientist Carl Bosch developed a scheme for implementing Haber's idea on an industrial scale.

Over the ensuing decades new factories transformed ton after ton of industrial ammonia into fertilizer, and today the Haber-Bosch invention commands wide respect as one of the most significant boons to public health in human history. As a pillar of the green revolution, synthetic fertilizer enabled farmers to transform infertile lands into fertile fields and to grow crop after crop in the same soil without waiting for nutrients to regenerate naturally. As a result, global population skyrocketed from 1.6 billion to six billion in the 20th century.



GET THE REST OF THIS ARTICLE NOW

**BUY THIS DIGITAL ISSUE
DOWNLOAD IT NOW!**

Digital Subscriber? [Sign-in Now](#)

Further Reading

[Spread of Deadly Cryptococcal Disease in U.S. Northwest Linked to Global Warming](#)

[Climate Change May Mean More Mexican Immigration](#)

[Ancient Ocean Acidification Intimates Long Recovery from Climate Change](#)

[The New Normal?: Average Global Temperatures Continue to Rise](#)

[Can Climate Change Cause Conservation?](#)

[Heat of the Moment: How Much Global Warming Are We Willing to Take?](#)

[Warming Waters Exacerbate Dwindling New England Fisheries](#)

[Scientists Quantify Global Warming's Threat to Public Health](#)