

April 8, 2005

The editors of *Nature* declined to publish the following letter, submitted 8 April 2005

*Sir*—The News Feature “Nitrogen study fertilizes fears of pollution” (*Nature* 433, 791; 2005) begins, “Urgent political and scientific action is needed to tackle the global threat of nitrogen pollution”. We urge the authors of nitrogen studies to freshen the data exciting their fears and then project cautiously.

An artist illustrated the News with a graph of industrial nitrogen production that climbs steeply after the middle of the 20<sup>th</sup> century. The graph included explosives to lift the 1996 quantity 18% above fertilizer use. The graph extends the mid-1970s increase to 1996 at 1.6% per year, a rate nearly twice as fast as the FAO reported for 1985 to 2002, and the compressed time of the x-axis makes an even steeper impression. It omits 1996 to 2002, a period when the FAO has already reported fertilizer increased only 0.3% per year.

The Letter “Agricultural runoff fuels large phytoplankton blooms in vulnerable areas of the ocean” (*Nature* 434, 211-214; 2005) mainly concerns fertilizer reaching the Gulf of Mexico. It concludes, however, with forecast fertilizer use for the nations facing the Pacific from Mexico to Chile. For these ten nations the authors forecast use rising to 2020 at 2.3% per year, twice as fast as the actual 1.1% per year from 1985 to 2002. In Mexico, which surrounds the Gulf of Mexico, nitrogen use actually declined a bit from 1985 to 2002. The authors’ forecast for the world in 2020 requires nearly tripling the actual global rate of change from 1985 to 2002.

The Commentary “Confronting the human dilemma” (*Nature* 434, 561-562; 2005) summarizes the Millennium Ecosystem Assessment, which also projects nitrogen fertilizer use. It projects nitrogen from all human activities growing at a constant rate to 2050 and an amount more than three times 2002 fertilizer use, even as UN demographers project slowing population growth.

A major, representative fertilizer producer reported that from 2002 to 2004 its fertilizer volume fell 30%, although the dollar value of its sales increased. The producer profited despite a cost of \$119 million for *shuttering plants*, which joined the quarter of North American production shut since 1999. Because natural gas comprises about 80% of the cost of nitrogen products, the producer also profited by selling its natural gas hedges at the peak of the market rather than making fertilizer. (Potash Corporation. 2004. Annual Report. Potash Corporation, Saskatoon, Saskatchewan Canada S7K 7G3)

When synthetic nitrogen fertilizer was a new technology, the FAO reported use rose 7.6% per year from 1961 to 1985. Unsurprisingly, after the new technology had penetrated all continents and farmers had learned how to apply it skillfully and economically, they increased their fertilizer use only 0.8% per year from 1985 to 2002. During the same interval, they lifted the production index number of crops 2.0% per year. We hope the International Nitrogen Initiative creates likely scenarios in addition to often-cited improbable, explosive ones.

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For alternative views of nitrogen fertilizer, see:

( available from <http://phe.rockefeller.edu> )

**[Nitrogen on the Land: Overcoming the Worries - Lifting fertilizer efficiency and preserving land for nonfarming uses](#)** Charles R. Frink, Paul E. Waggoner, and Jesse H. Ausubel *Pollution Prevention Review* 11(3):77-82 (Summer 2001)

**[Nitrogen Fertilizer: Retrospect and Prospect](#)** Charles R. Frink, Paul E. Waggoner, and Jesse H. Ausubel *Proceedings of the National Academy of Sciences USA* 96:1175-1180, 1999. The rising fertilizer use accompanying more people eating more has been called exponential and prompted fears of polluted water and consequent methemoglobinemia and hypoxia. It also has raised alarm about greenhouse warming and an altered global N cycle and thus primary production and diversity of vegetation. In this plethora of issues we concentrate on a few, beginning with the fundamental one of how fast N fertilizer use has risen in the world and in an industrial nation, the United States, where early, rapid adoption may foretell the course in the world. We also shall explore how much deposition of N from the atmosphere has increased. After examining the changing ratio of fertilizer N application to its intended incorporation in crop yield, we shall discuss prospects for more or less N fertilizer by 2070 when the earth's farmers may be feeding 10 billion people and sparing more or less habitat for nature.