

Excerpt from NATIONAL GEOGRAPHIC MAGAZINE – MAY 2013 “Curse of Fertilizer”

1) Between 1975 and 1995 China built hundreds of nitrogen factories, quadrupling the country’s manufacture of fertilizer and turning China into the world’s biggest producer. Song now spreads about five times as much nitrogen as before, saturating his fields with urea—a dry form of nitrogen—by casting handfuls of the snow-white granules across green shoots. This adds up to 530 pounds of nitrogen per acre. Farmers who grow vegetables use even more; some spread a ton of nitrogen, or even two, on each hectare (2.47 acres). Few of them think they’re doing anything harmful. “No, no pollution,” says Song, when asked about the environmental effects of fertilizer.

Scientists tell a different story. “Nitrogen fertilizer is overused by 30 to 60 percent” in intensively managed fields, says Xiaotang Ju, of the China Agricultural University in Beijing. “It’s misuse!” Once spread on fields, nitrogen compounds cascade through the environment, altering our world, often in unwelcome ways. Some of the nitrogen washes directly from fields into streams or escapes into the air. Some is eaten, in the form of grain, by either humans or farm animals, but is then released back into the environment as sewage or manure from the world’s growing number of pig and chicken farms.

2) Deli Chen recalls catching fish as a boy. “The river was so clean. You could see right through it,” he says. By 1980 “you couldn’t see the fish anymore.” The cloudiness came in part from proliferating phytoplankton, a symptom of water that’s eutrophic, or overloaded with nutrients. A recent national survey of 40 lakes in China found that more than half of them suffered from too much nitrogen or phosphorus. (Fertilizer containing phosphorus is often to blame for algal growth in lakes.)

Excess nutrients are damaging fisheries in China’s coastal areas in the same way that fertilizer runoff flowing down the Mississippi has destroyed fisheries in the Gulf of Mexico: by creating dead zones in which algae and phytoplankton bloom, die, and decompose, using up oxygen and suffocating fish.

3) Worldwide, commercial fertilizer adds up to 70 percent of the nitrogen that human activity produces every year. Nitrate-eating bacteria in the soil can convert these disruptive forms of nitrogen back to the original, environmentally benign source that makes up nearly 80 percent of our atmosphere. But even this process is a mixed blessing, as the bacteria also release small amounts of nitrous oxide, a powerful greenhouse gas.

4) Michigan State’s Phil Robertson, who helped set up this long-running experiment, takes me on a tour of the fields. He’s itching to reveal some new and “quite amazing” data. Each field planted according to standard plowing and fertilizer recommendations released 610 pounds of nitrogen per acre into Michigan’s shallow groundwater over the past 11 years. “So about half of the fertilizer that’s added we lose,” Robertson says. This loss is much less than what’s common in China. Yet when multiplied by tens of millions of acres of American cropland, it’s enough to produce polluted groundwater, a nutrient-loaded Mississippi River, and an enormous dead zone in the Gulf of Mexico.