Humans have approximately doubled the rate at which nitrogen (N) is entering the earth’s ecosystems compared with preindustrial times (Vitousek et al., 1997; Smil, 1999). The two most important sources of N for agriculture are synthetic fertilizers and symbiotic N₂ fixation by cultivated legumes (Smil, 2001; Herridge et al., 2008). The ability of the legume–rhizobia symbiosis to improve the availability of N for other crops has been utilized for thousands of years in traditional farming systems and modern crop rotations. Before the advent of N fertilizers 25 to 50% of a farm was typically maintained in a legume-rich pasture or cover crop, and it has been estimated that in some farming systems in the 1950s as much as 50% of all available N may have originated directly from symbiotic N₂ fixation by leguminous food, forage, and green manure crops (Smil, 2001). However, most farmers around the world have progressively replaced legume rotations and organic sources of N fertility with synthetic N fertilizers over the past 3 to 4 decades, so that U.S. agriculture now derives almost half of its total N supply from fertilizers, and two-thirds of all N in China’s food originates from the Haber-Bosch synthesis of ammonia (Smil, 2001). The rapid adoption of synthetic N, which occurred in parallel with the increasing availability of fossil energy, is reflected in annual global fertilizer consumption which increased from 11 million megagram N in 1960 to around 80 million megagrams throughout the 1990s (Crews and Peoples, 2004). In addition to increasing farmland productivity in the short term, the adoption of synthetic N fertilizers increased the overall farm production of food crops by allowing farmers to grow cereals or other crops on land that would have otherwise been dedicated to fertility-generating legumes. However, as will be discussed later, legumes contributed also to a range of ecosystems services and provided many non-N benefits to following crops in addition to supplementary N.