

# **SUSTAINABLE MANURE MANAGEMENT IN THE NITROGEN RECYCLING SYSTEM**

**Junichi Takahashi**

*Department of Animal Science, Obihiro University of Agriculture and Veterinary  
Medicine, Obihiro, Hokkaido, Japan 080-8555*

The innovation of synthetic ammonia by the Haber-Bosch process has contributed greatly to an increase in food production and an unprecedented expansion of the world population. It has come to supply 1/3 of the amount of protein now assumed to be necessary for the world population of 6.2 billion people. That is, only a population of 4 billion people could be supported by organic farming, which uses effluents and green manure. However, serious environmental pollution has been caused by the unrestricted use of synthetic fertilizers. Once a stable-pair of nitrogen atoms in the atmosphere change into reactive nitrogen, they take on various forms. Therefore, such nitrate pollution problems as soil and hydrosphere contamination and greenhouse effect, depletion of the ozone layer, acid rain, and photochemical smog attributed to the nitrous oxide in the atmosphere. How can a method of sustainable animal agriculture, which supports a world population of 6.2 billion people and preserves the environment, be developed? In the case of Japan, the nitrogen inflow from the foreign countries as foods and feed is about 920,000 tons. It is far more than 570,000 tons of chemical fertilizers. Human and livestock eventually excrete huge amount of food and feed nitrogen. Nitrogen excreted from human accounts 740,000 tons including garbage and 750,000 tons attributed to livestock. As for livestock manure, 94% is supposed to be recycled. However, if this nitrogen was evenly scattered to the farmland, it becomes about 150 kg of nitrogen a hectare. The inflow of a large amount of nitrogen expands the nitrogen circulation in Japan now, and it drives serious environmental pollution as nitrate nitrogen. Nitrogen recycling system including manure management must be established to sustain the hypertrophied agriculture and animal agriculture. New technology to strip ammonia from digested effluent in the biogas plant was proposed to recycle the effluent nitrogen improving poor quality of agricultural byproducts.