

## **Session 1: Sustainable Development of Animal Production**

### **Technologies Coping with Global and Local Environmental Issues Related to Livestock Development**

#### ***Masaki Shibata***

Director, Institute of Livestock Industry's Environmental Technology, Livestock Industry's Environmental Improvement Organization, Japan

Population growth and income growth in developing countries cause an increase in the demand of livestock products. It is considered that increased consumption of livestock products brings the nutritional benefits to the people that are still largely deficient in intake of animal protein. Furthermore, livestock provide income and increased economic stability, and are often the most important "cash crop" in small-scale mixed farming systems as being pointed out by Devendra and Thomas. However, the rapid expansion of livestock development likely causes global and local environmental problems. The agriculture in Japan experienced these problems in the process of development of animal industry. This report discusses these environmental problems and introduces current developments of technologies to solve such problems based on the Japanese experience.

#### **Use of food waste for animal feeding**

Urbanization induces an imbalance in nutrient accumulation. While large amounts of nutrients accumulate in urban areas as food waste, livestock in the countryside suffer from malnutrition. Technological developments in the use of food waste for animal feed contributes to the improvement of self-sufficiency rate of food and to the correction of the imbalanced accumulation of nutrients, which makes animal-agriculture more sustainable. Methods of processing food waste for animal feeding are generally classified into three categories such as dehydration, silage and liquid feeding. Recently, fermented liquid feeding system with food waste has attracted special interest in Japan. Various kinds of food waste from food industries were collected, mixed, heat-treated, inoculated with starter culture containing lactic acid bacteria and incubated for the preparation of fermented liquid feed. The pigs given the fermented liquid feed showed equivalent growth performance in comparison with the one given commercial feed.

#### **Development of technologies on animal waste treatment**

Rapid increase in animal production in developing countries to meet the demand for livestock products can cause local and global environmental issues originated from imbalance between manure load and environmental capacity of the farmland and from improper manure management, including odor, insanitary insects, water pollution and eutrophication, greenhouse gas emission, etc. On the other hand, manure is a valuable resource. Recycle use of manure would be a key issue for the sustainable development of agriculture in infertile land. Not only nutrients, such as nitrogen, phosphorus and other minerals, but also other resources, such as heat and carbon dioxide, can be obtained from proper manure management. New technologies relating to manure management, such as composting system with vacuum-type aeration,

phosphate recovery as struvite crystals from swine wastewater, and methane fermentation by upflow anaerobic sludge blanket (UASB) reactor have been developed in Japan.

### **Development of technology on climate change**

Considerable attention has been paid to the global warming. Agriculture contributes significantly to anthropogenic emissions of greenhouse gases (GHGs), and climate change affects agricultural production. In livestock sector, while ruminants are thought to be major anthropogenic sources of methane, productivity of livestock is affected by ambient temperature. By the combination of the database of “Climate Change Mesh Data (Japan)” and the data on the relation between ambient temperature and meat production, geographical differences in the effect of climate change on meat production in Japan were examined. Methane emission from ruminants kept in different environments and feeding managements has been analyzed, and technologies to prevent a further decline in the livestock productivity caused by global warming and to reduce GHGs emissions have been developed. Improvement of productivity in ruminants would be one of the most effective solutions to reduce methane emission per unit of products. Collaborative research project between Thai government and Japan International Research Center for Agricultural Sciences (JIRCAS) examined precise nutrient requirement of beef cattle in Thailand, which contributes to an improvement of beef production and consequently to a reduction of methane emission per unit of beef production.



#### **Masaki Shibata**

Director, Institute of Livestock Industry's Environmental Technology,  
Livestock Industry's Environmental Improvement Organization, Japan

#### Academic Degrees

1982 Dr., Agriculture, Hokkaido University, Japan

1970 B.A., Agriculture, Hokkaido University, Japan

#### Field of Study

Animal Nutrition