

Soil management for sustainable and environment-friendly precision agriculture

Won Kyo Jung, NIAST, Korea

The importance of soil management in sustainable agriculture and environment-friendly agriculture is well recognized for past half a century in Korea. In many countries, appropriate soil management have considered as a major factor not only for agricultural production but also for natural resources management as a part of ecological management system. In addition to crop science development, soil management technologies including fertilization and composting contributed to improve agricultural productivity. Agricultural chemicals, such as fertilizer, pesticide, herbicide and so on, have helped to improve productivity but also have greatly impacted on environmental quality such as water quality and soil quality. In Korea, the per capita arable land being very small (smallest in the world), the maximum possible yield has ever been sought in all crops including rice. Particularly, during the past half a century or so, high yield of rice has been achieved by adapting high yielding varieties and high inputs. As the results, in the recent years, worry has arisen whether the quality of Korean rice field soils have been deteriorated particularly due to heavy uses of chemical fertilizers. High-yield oriented rice production may occur environmental issues such as water quality and nutrient efficiency. We have developing an environment-friendly agriculture, which is sustaining productivity with least negative impact on agricultural environment. Reducing chemical fertilizer and pesticide is a key factor for success of an environment-friendly agriculture. We attempted to grasp the change in the soil quality of Korean rice field soil by comparing the soil analytical data collected from 1960s to recent years. Our results indicated that the soil quality of rice field soil in Korea, has tended to be increased than decreased. For instance, between 1999 and 2003, the quality of rice field soil was significantly increased in 44%, slightly decreased in 18%, remainder unchanged. Available P and available silica content tended to increase persistently. Between 1999 and 2003, soil organic matter content tended to increase slightly. Eventually, the yield of rice has been increased the past decades in Korea.

We have learned that appropriate management of chemical fertilizers may improve soil quality. Precision farming, site-specific management may be the choice to manage our agro-ecosystem to meet increasing productivity and minimizing negative impact of agro-ecosystem. Korean soil quality has been monitored to evaluate environmental impact of soil management for many years. A paddy soil quality, which is long-term fertilizer application research experiment showed that soil quality has been improved for 54 years of appropriate agro-chemical management.