Development of a Portable Sensor Using Soil Fluorescence as an Indicator of Fertility in Rice Paddies

Kondo, Jun (School: Kyoto Tachibana High School)

The purpose of this research is to develop a portable fertility sensor with a mapping function based on fluorescence intensities in rice paddies for optimum fertilization contributing to sustainable agriculture. The fertilizer monitoring experiment in containers revealed that fluorescence intensities of basal fertilizers were flown away within a month and that deeper soil kept the fluorescence intensities longer than shallow soil due to water paths between containers and soil. Regarding the additional liquid fertilizers containing citrus peel fluorescence substances, the fluorescence intensities of shallow soil accordingly increased on the condition of less precipitation of 900 mm/year, while they did not on the conditions of 1800 and 3600 mm/year because of the large amount of irrigation and number of the water paths. It was considered that similar phenomena might occur in the open fields. The field experiment using the developed fertility sensor showed that the sensor appropriately monitored the amounts of organic and chemical fertilizers and that the slaked lime treatment also fluoresced to some extent, which was considered due to the effect of soil acidity and alkalinity on soil fertility. It was possible to make a fertility map within 2 m errors from the sampling locations assigned by the smartphone GPS. It is expected that the fertility maps can contribute to the optimum fertilization by reducing the environmental loads, wasted fertilizers, and losses of products, if larger areas of crop fields are measured by vehicles with fertility sensors which companies may commercialize.

Awards Won:
Fourth Award of $500