〈Summary〉

Purpose& Contents	The purpose of this research was to develop a variable rate fertilizer spreading system based on soil and crop properties with ISO11783 communication protocols. A prototype soil organic matter spectrophotometer was manufactured to acquire the information of soil and crops, and implemented indoor performance evaluation. Soy bean growth data was obtained and an estimation model was developed with a growth measurement system. A commercial centrifugal spreader was modified as attaching a discharging location control unit and a flow rate control unit. Spreading database was constructed for each control factor to influence on spread patterns and a variable rate spreading system was ultimately developed by the control units.
Results	A soil organic matter sensing system was composed of a monitoring unit, a sensor probe and a cone penetrometer. The size of the monitoring unit of the system is 250(L)×105(W)×70(H) mm, and the total length of the sensing system is 770 mm with a sensor probe. Estimation models were developed using NDVI and GNDVI to measure the growth of vegetation, and the regression result showed that GNDVI model had higher performance than NDVI model. After estimating total dry weights, R^2 which represents accuracy was 0.74 and RMSE which represents precision showed 17.5g for GNDVI, and R^2 of 0.639 and RMSE of 20.56 g were reported for NDVI, respectively. A spreading system which controls a rate based on a fertilizer amount setting and a tractor speed was constructed with a discharging location control unit, a flow rate control unit and a GPS. The uniformity test of the spreader showed a promising result with lower than 15% of coefficient variation and possibility of creation for uniformly distributed spread patterns.
Expected Contribution	The use of fertilizer content can be reduced about 20% in a conventional soy bean farming. Excessive application can be avoided with a variable rate technology as spreading fertilizers within 15% of error, thus soil contamination and crop damage can be minimized. The developed systems and technologies can be applied to other upland field crops and contributed to mechanization for the upland crops. Invigoration of agricultural machinery and sensor business can be expected by securing the foundation of precision agriculture

Keywords	precision agriculture	soybean	soil sensor	growth measurement	variable rate control