

Development of the Soil Sampling System with Soil Property sensor

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Objectives

Although soil information is essential to prescribe variably in precision farming, Current soil analysis method needs much labor and time. So it is important to develop soil sampling mechanism which structure and operation is simple and which can identify soil properties

This study was conducted to develop soil sampling system which could detect some soil properties - soil hardness, electro conductivity (soil EC), soil moisture, etc - on the going

Materials and Methods

Soil sampling system was composed of soil hardness measurement device, soil sampling device, electrode for soil EC(electric conductivity) and soil moisture, which could attach three point hitch of tractor

Soil sampling device was designed to sample soil until to 20cm depth by penetrating sampling probe pressed by hydraulic cylinder and rotated by hydraulic moter when tractor was stopped. Soil hardness measurement device was designed to measure soil hardness by load cell and linear potentiometer while cone penetrometer entered into soil Electrode for measurement of soil EC and moisture was designed to radiate radio wave of 10Mhz and 100Mhz by spiral antenna. And geographical position sampled soil and detected sensor data were stored in computer memory

Results and Discussion

- As the result, it was possible to take a sample soil in 46 seconds, and soil hardness measurement device indicated less than 5% as error compared with hand type soil hardness meter, and soil EC and moisture showed difference of 12~26%comparing with chemical analysis
- In this paper, we presented the soil sampling system with soil sensor that was developing now. We have to consider operating convenience of farmer and to improve working speed and accuracy in the future

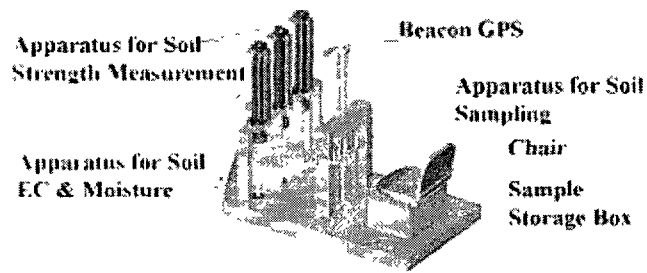


Figure 1 System concept of soil sampler

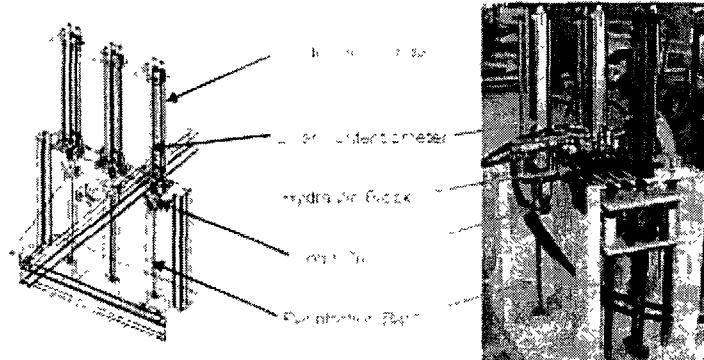


Figure 2. Design and manufacturing of soil hardness measuring device

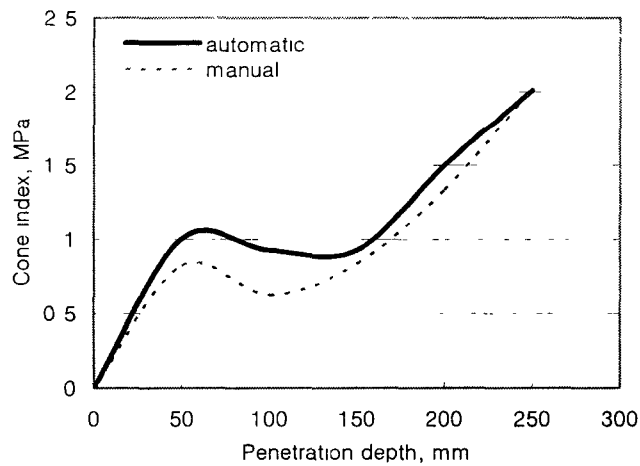


Figure 3. Comparison of cone index determined by the developed and a SR-2 cone penetrometers.

Table 1. Results of measuring soil hardness using the soil sampling syste.

Penetration depth(cm)	Soil cone index(MPa)									
	1	2	3	4	5	6	7	8	9	10
5	0.823	0.874	0.65	0.561	0.941	0.330	0.496	0.400	1.755	0.670
10	0.623	0.690	0.685	0.432	0.774	0.560	0.489	0.231	1.030	0.452
15	0.834	1.054	1.579	0.627	0.732	0.360	0.943	1.074	0.932	1.359
20	1.332	1.740	1.780	1.337	1.664	0.743	1.230	1.248	1.751	2.567
25	2.020	1.331	1.900	1.795	1.953	0.961	1.275	0.981	3.177	3.306
30	1.933	1.753	1.517	1.922	1.944	1.319	0.990	1.413	4.029	3.773