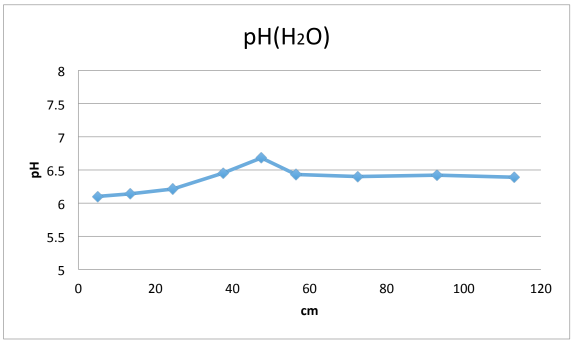
Resuls of the soil profile observation and laboratory analysis

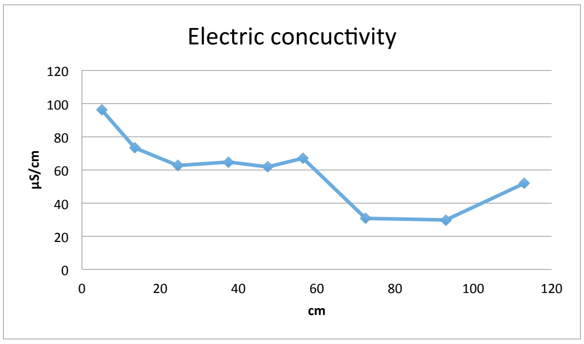
in the field of the junior course, Obihiro University of Agriculture and Veterinary Medicine

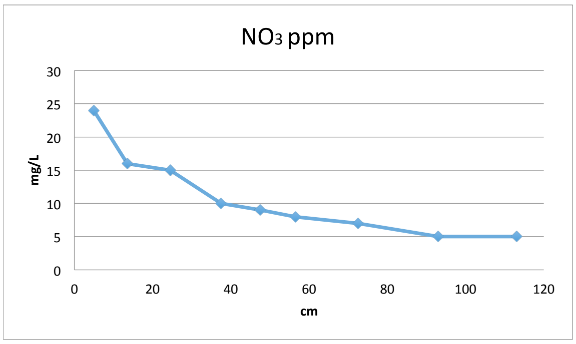
N 42° 52′ 15.66″, E 143° 10′ 33.64″, altitude 79 m (according to GPSmap 60CSx) Date of sample collection: May 26, 2014

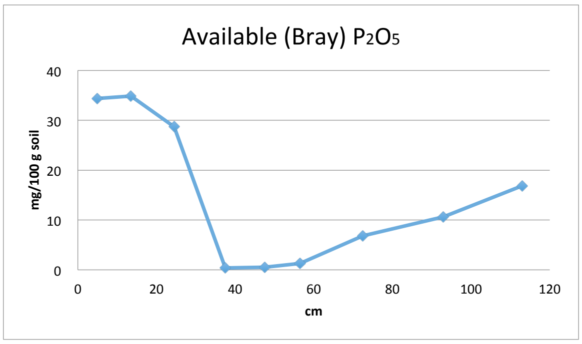
analyzed by JICA Farmer-led extension course in February, 2015 Date of laboratory analysis: February 5, 2015

field observation				by the Midori-kun rapid test				by meters				
Layer	depth	texture	color	rapid test pH	NO_3 ppm	K_2O ppm	P_2O_5 ppm	depth (average) cm	pH(H_2O)	EC (μS/cm)	NO_3 ppm	Bray P_2O_5 mg/100g soil
Ap_1	0 -10 cm	SiL	7.5YR1.7/1	6.5	15	50	7	5	6.1	96.2	24	34.4
Ap_2	10 - 17 cm	L	7.5YR2/1	6.0	15	7	7	13.5	6.14	73.2	16	34.9
2A	17 - 32 cm	SiL	7.5YR3/1	6.5	15	17	7	24.5	6.21	62.6	15	28.7
$2B_w$	32 - 43 cm	CL	5YR3/3	6.0	0	17	7	37.5	6.45	64.7	10	0.4
2BC	43 - 52 cm	SL	5YR4/4	6.5	0	17	7	47.5	6.68	61.8	9	0.5
2C	52 - 61 cm	HC	7.5YR4/6	6.5	0	17	7	56.5	6.43	67	8	1.3
$3B_w$	61 - 84 cm	SL	10YR4/6	5.5	0	7	7	72.5	6.4	30.8	7	6.9
3BC	84 - 102 cm	CL	10YR5/6	6.0	0	7	7	93	6.42	29.8	5	10.6
3C	102 - 124 cm	HC	10YR4/4	5.0	0	17	7	113	6.39	51.8	5	16.9









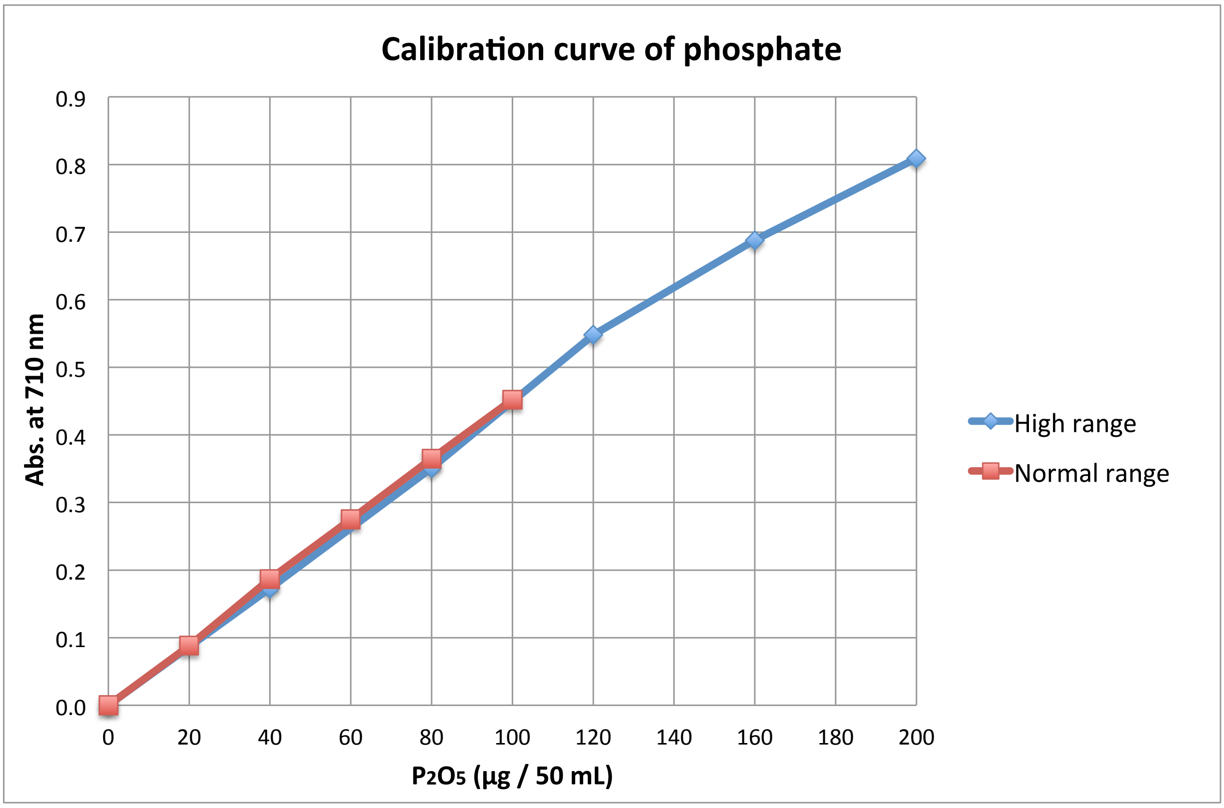
Calibration data of Bray No.2 P_2O_5 determination by "Pack Test" reagent.

P_2O_5 μg/50mL	High range	Normal range
0	0.000	
40	0.1730	
80	0.351	
120	0.548	
160	0.688	
200	0.809	
0		0.000
20		0.0880
40		0.187
60		0.275
80		0.365
100		0.452

Colorimetric determination of samples

Layer	depth (cm)	Volume (mL) of sample filtrate	OD 710 nm	P_2O_5 μg/50mL	P_2O_5 mg/100g soil
Ap_1	0 –10 cm	5	0.391	85.9	34.4
Ap_2	10 – 17 cm	5	0.397	87.2	34.9
2A	17 – 32 cm	5	0.327	71.8	28.7
$2B_w$	32 – 43 cm	5	0.004	0.9	0.4
2BC	43 – 52 cm	5	0.006	1.3	0.5
2C	52 – 61 cm	5	0.015	3.3	1.3
$3B_w$	61 – 84 cm	5	0.078	17.1	6.9
3BC	84 – 102 cm	5	0.121	26.6	10.6
3C	102 – 124 cm	5	0.192	42.2	16.9

Calculated according to the calibration curve in the normal range.



Calibration curve is straight up to 120 μg / 50 mL.

Nitrate concentration in vegetable

	sample weight (g)	added water (mL)	NO_3 ppm in homogenized sample (ppm)	NO_3 ppm in vegetabe (ppm)
Spinach	24.8	475	110	2217
Cabbage	25	475	31	620

Measured with Laqua-twin for NO_3 from Horiba Co. Ltd.

Usually, vegetables are grown with high rates of fertilizer.
Nitrate concentration in vegetables have high values accordingly.
Too high nitrate will cause lower sugar and vitamine contents in vegetables,
and also not good for human health.

Comments to the Soil Diagnosis Practice for "Farmer-led Extension Method" course held in February 2015. Kiyoshi Tsutsuki

I was very happy to hear from you that you could enjoy my lecture and practice on soil diagnosis.

The program of one day was too short to carry out the entire menu prepared by me. In the mid-winter, we also could not go out to see the field.

Anyway, I would be happy if you can use the knowledge learned here in the extension service in your country.

The place where we made the soil profile had been used for pasture for many years, and just a few years ago changed to upland crop field. The field has not been used intensively.

The pH of the top A layer was around 6 and increased to 6.5 in the sub-layers, which is good for crop cultivation.

The EC was highest in the top layer and decreased with depth. The EC value in the top layer was 100 μS/cm = 0.1 dS/m, very low value for upland crop field in spring. The field had not received fertilizer at the time of soil profile survey. The soil layers originating from Eniwa volcanic ash (61 cm – 102 cm) had very low EC.

The concentration of NO_3 was also very low, because it was before the fertilizer application. The value decreased with depth, reflecting the leaching out with rainwater.

Available phosphate was relatively high (30 – 35 mg / 100g) in A and 2A layers, which may be due to the effect of soil organic matter. In the 2B, 2BC and 2C layers had very low available phosphate, reflecting the characteristic of Tarumae d volcanic ash fell around 9000 years before present. Tarumae d volcanic ash is relatively rich in iron, and highly weathered, which caused the very high phosphate absorption capacity. The layers 3B, 3BC, and 3C (61 – 124 cm) originating from Eniwa volcanic ash, which fell around 17,000 years ago, had relatively high available phosphate. It may be due to the relatively lower phosphate absorption capacity of this volcanic ash, and also due to the influence of the flow of ground water, which carried soluble phosphate from surrounding crop fields.

The determination of available phosphate using the "Pack Test" reagents was very successful. The calibration curve was straight. I repeated it two times, first at the concentrations of 0, 20, 40, 60, 80, 100 μg P_2O_5 / 50 mL, and second at the concentrations of 0, 40, 80, 120, 160, 200 μg P_2O_5 / 50 mL on the next day. The results showed that the calibration curve was straight at the concentrations lower than 120 μg P_2O_5 / 50 mL. The inclinations of the two calibration curves were almost same. I also tried the normal routine method for the phosphate determination. The calibration curve was also straight up to the concentration of 120 μg P_2O_5 / 50 mL. However, the coloring reagent of the routine method is very unstable and we have to prepare it on the day when we carry out the determination. Usually we prepare excess amount of reagent using sulfuric acid, ammonium molybdenum acid, and ascorbic acid. On the other hand, "Pack Test" kit is very stable and we do not need to prepare excess reagents. Calibration curve is very reproducible, and we may not need to make it every time. Just one concentration, 100 μg / 50 mL is enough to confirm the sensitivity of Pack test reagent every time.

The nitrate concentration in the vegetable was determined because nitrate has some effects on the quality of vegetables. As vegetables are harvested during their nutritional growth stages, many vegetables are also grown in the green house with high application rates of fertilizers. Such backgrounds make the concentration of nitrate in vegetables extremely high. Spinach in this season are from green house cultivation, and cabbage are grown in the open field, which are reflected in the high NO_3 in spinach (2200 ppm) and lower NO_3 in cabbage (620 ppm).