



# LOST SANDBAR



## -Preliminary exploration of soil characteristics in Keelung

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## 1. Abstract

This study is to explore the relationship between soil and rain and change in pH. We discover:

- a. The soil is alkaline: Keelung rainwater is indeed acidic. The average pH in 2020 is about 4.3, but the pH value of the soil we observed is alkaline, which is different from the state we imagined.
- b. The soil pH value will recover: Although the rainwater is acidic, the pH value will increase after the rain.
- c. Differences in vegetation cover: The part with vegetation is more alkaline than the one without vegetation.
- d. Humidity and soil acid-base: When the humidity rises, the pH value of the soil will change, including the increase in the pH value of the vegetation but the decline without the vegetation.

We speculate that it may be the microorganisms in the soil or that the rainwater reacts with the soil, and further research is needed in the future.

## 2. Research questions

Almost every region in Taiwan has its own famous crops. For example, Yilan has Sanshing scallions; Taitung has sugar apples, but Keelung does not have its own crops. We happened to participate in school's GLOBE observation project which includes observations on soil. We want to use the observation agenda to explore if it is true as the report indicated that Keelung's soil is not suitable for growing crops because of the pH value of rainwater due to rainfall. Because Keelung rains almost every day in winter, according to the journal literature, the pH value of Keelung precipitation is small. According to the definition of acid rain, the pH value of Keelung precipitation is indeed acid rain. Will its weak acidity affect the soil? Combining the pH value of rainwater with the characteristics of the hilly terrain, the falling rainwater enters the ground to

become groundwater and flows through the soil layer on the entire slope, resulting in soil acidification.

Then, we'd like to research questions about:

- a. What happens to the soil pH when it rains in Keelung?
- b. After the rain, will the pH of the vegetation and the soil covered by the vegetation be different? If so, what are the reasons?

### 3. Research Methods

- a. Experimental equipment: shovel, conical flask (250ml), distilled water, fresh-keeping box \* 3 (filling soil, distillation Water, rain), glass rod, spoon, small beaker, scale, pH meter, as shown in figure (1)



figure(1) Research tools

- b. Sampling location: back campus fields A. There is vegetation B. No vegetation, as shown in Figure (2)



Figure (2) Sampling location

### c. Research Process

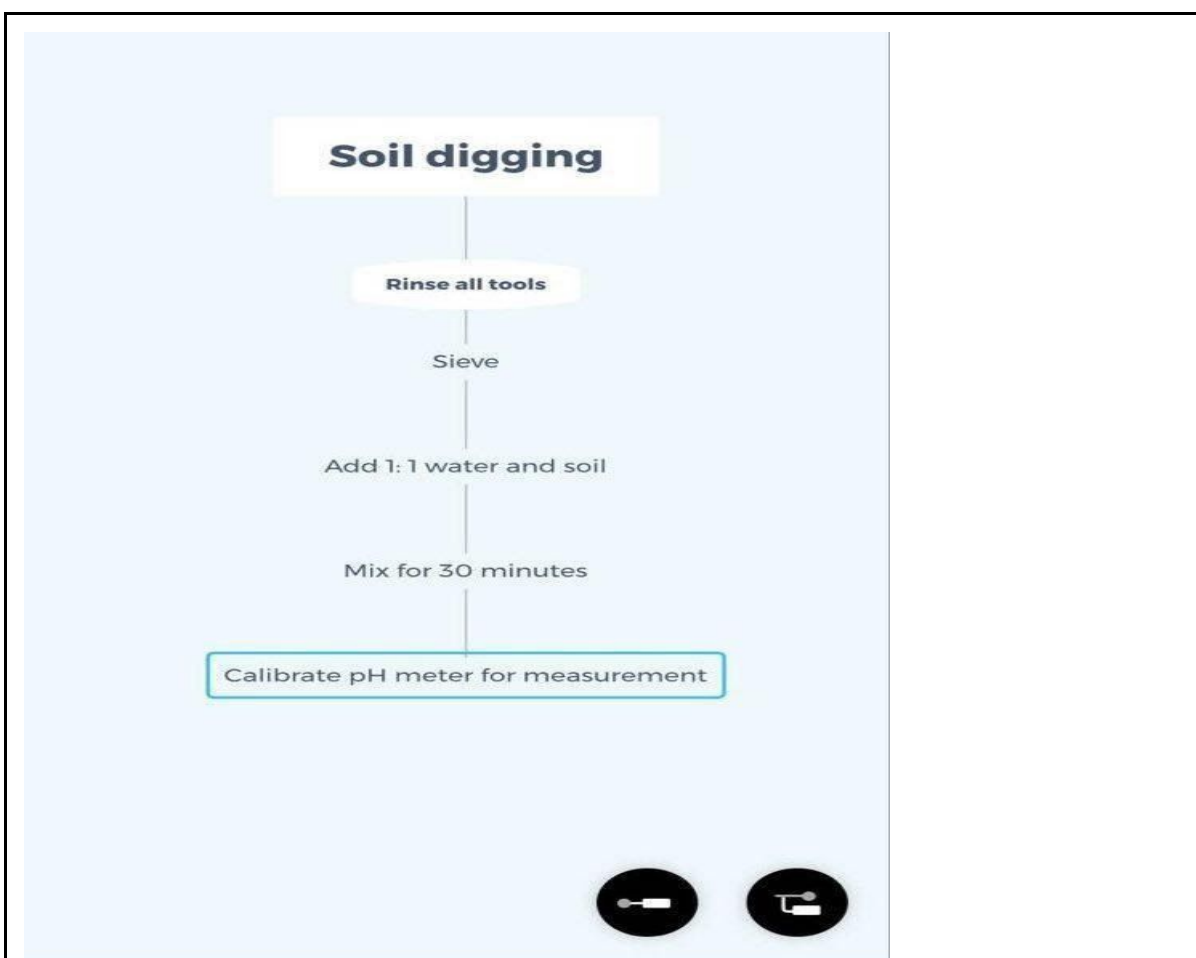


Figure (3) Research process

## 4.Results

a. What happens to the soil pH when it rains in Keelung?

The dates of precipitation are 2/7, 2/17, 2/27, and 3/1, and according to the Central Weather Bureau, the average annual pH value in Keelung is about 4.6 (Source: Central Meteorological Bureau [https://www.cwb.gov.tw/V8/C/D/phRain\\_All.html?Tab=Year](https://www.cwb.gov.tw/V8/C/D/phRain_All.html?Tab=Year)), as shown in Figure (4), but the pH value of the soil we observed is slightly alkaline. As shown in table (1)

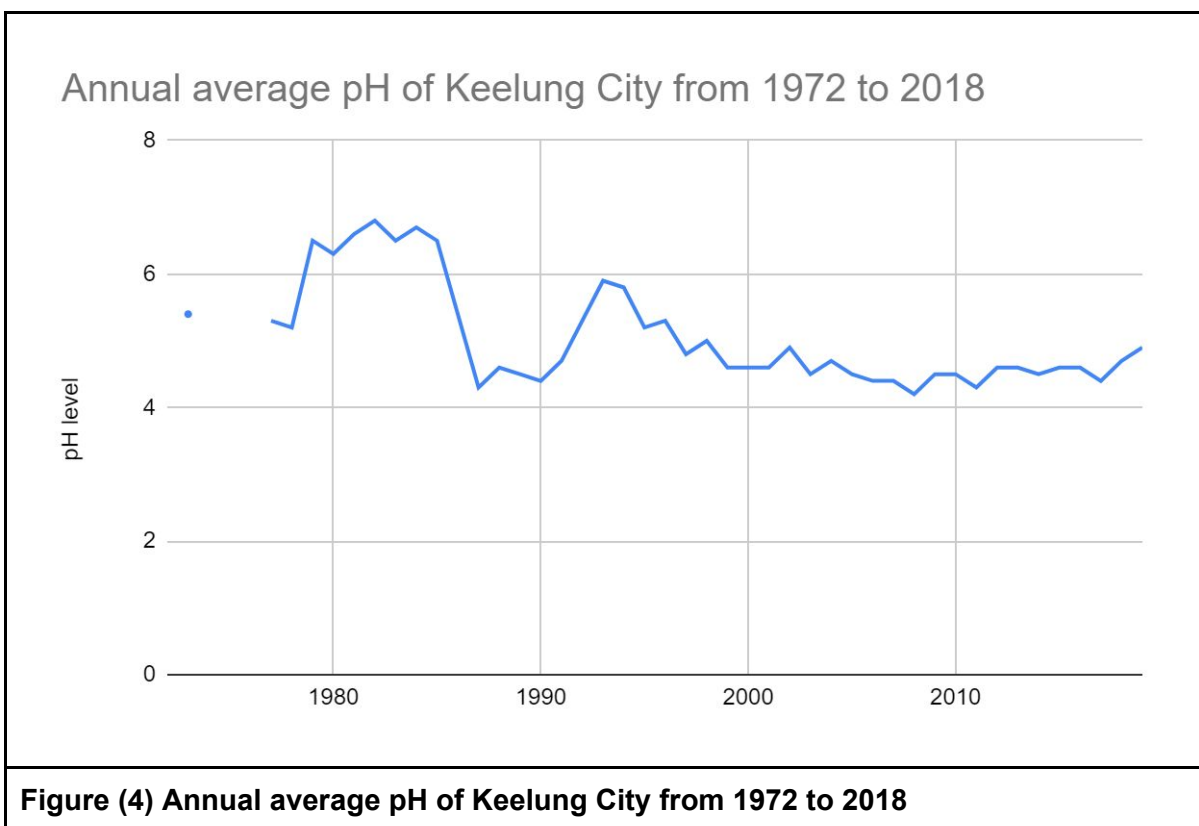


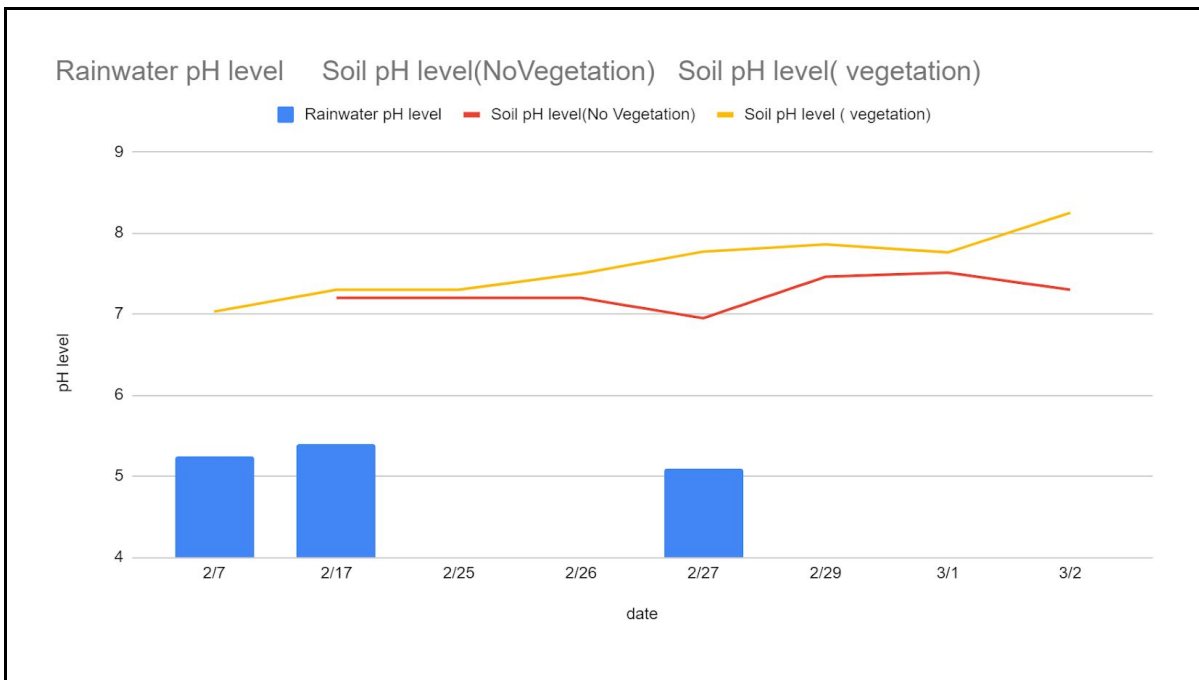
Table (1) Record of sampled soil							
date	2/7	2/17		2/25		2/26	
site	A	A	B	A	B	A	B
Soil surface temperature(°c )	17.6	23.6		40		32	
Rainwater pH	5.24	5.4					
Soil pH	7.03	7.3	7.2	7.3	7.2	7.5	7.2

<b>Current temperature(°c )</b>	15	10.4		24.5		24.8	
<b>Max / Min temperature of the day (° c)</b>	15.7/15.1	11.9/9.4		24.5/21.7		24.3/17.1	
<b>Max / Min soil temperature of the day (° c)</b>	16.3/16.1	14.5/14.3		17/16.4		20.1/17.5	
<b>weather</b>	rain	rain		sunny		sunny	
<b>rainfall(mm)</b>	26	100		0		0	
<b>humidity(%)</b>	78	54		72		76	

<b>date</b>	2/27		2/29			3/1		3/2	
<b>site</b>	A	B	A	B	C	A	B	A	B
<b>Soil surface temperature (°c)</b>	20.5		32.6			20.4		14.5	
<b>Rainwater pH</b>	5.1					3.7			
<b>Soil pH</b>	7.77	6.95	7.86	7.46	7.58	7.76	7.51	8.25	7.3
<b>Current temperature (°c)</b>	20.5		25.3			18.6		14.6	
<b>Max / Min temperature of the day (° c)</b>	20.5/ 20.3		25.8/ 16.4			20.2/ 17.4		14.8/ 14.4	
<b>Max / Min soil temperature of the day (° c)</b>	25.1/1 6.6		20.3/18. 5			18.3/18. 2		19.1/15. 4	
<b>weather</b>	rain		sunny			cloudy		cloudy	
<b>rainfall(mm)</b>	58		0			1		0	
<b>humidity(%)</b>	80		32			85		70	

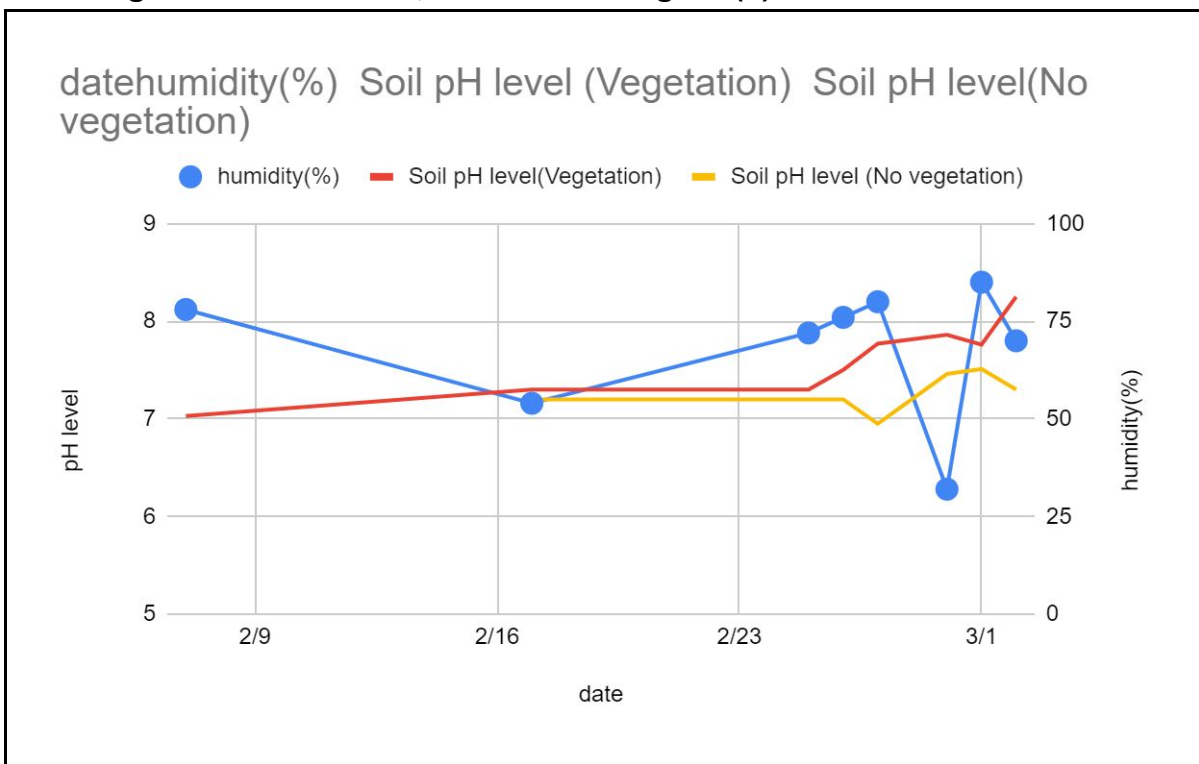
**b. After the rain, will the soil pH be different between the vegetation and the uncovered soil? If so, what are the reasons?**

**(a) The pH value of the site with vegetation is higher than that without vegetation, as shown in Figure (5)**



**figure(5)**

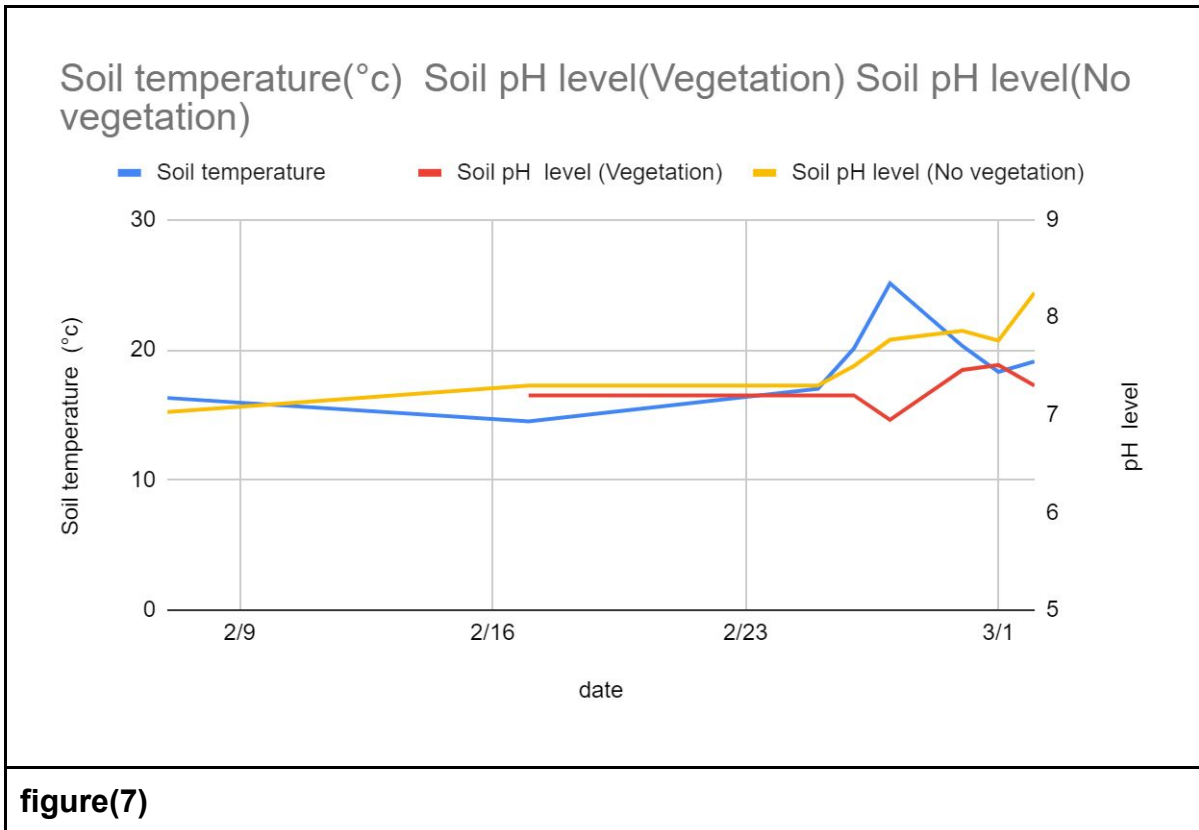
**(b). When the humidity increases, the pH value of the vegetation increases but the vegetation decreases, as shown in Figure (6).**



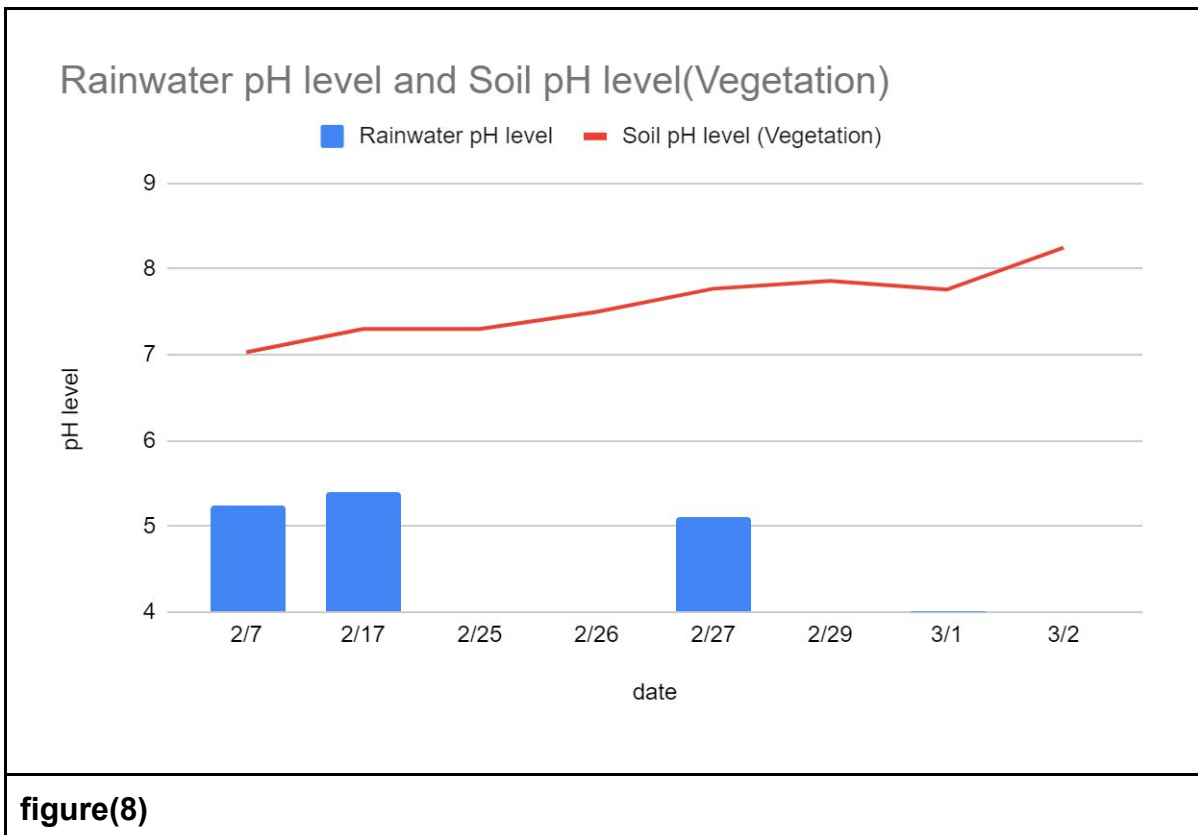
figure(6)

(c). When the temperature rises

The pH value of no vegetation decreases and the pH value of vegetation increases, as shown in Figure (7)



(d). Although the water is acidic, the pH value of the soil after rain has been slightly increased, as shown in Figure (8).



## 5.Conclusion

The place with vegetation does show a more alkaline response. According to the literature, we speculate that the soil may have a microbial reaction, or it may be like the concept of a "buffer solution" in our high school textbook. According to the literature, the soil contains a buffer. Substances are compounds such as clay particles, organics, carbonates, and phosphates in the soil. They can be replaced with hydrogen ions in the soil solution, so that the pH of the soil will not change significantly. It may also be due to the type of soil, particle size, and humidity degree of influence. These experiments will be included in observations in the future. Next, we will also use telemetry to compare the differences in image shooting caused by different soil concession layers, and study why the soil may return to alkaline.

## 6.Bibliography/citations

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