

Research Title : Study the Properties of the Soil in the Cultivated Area to Develop a Web Application that is used to Analyze the Soil Quality Suitable for Local Crops

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Abstract

Currently, Thailand has many problems with soil management. Whether the soil is poor quality, lack of nutrients, lack of water, and there are still soils in many areas where the land has deteriorated because of monoculture. This deteriorating soil condition is a problem in cultivation in all regions. The northeastern region has the greatest soil resource problem. Because it is a dry area, not suitable for growing plants. In addition to making cultivation more difficult, farmers' incomes are also reduced. When incomes declined, there was no funding for farming. Kalasin is one of province that faces such problems. For the benefit of farmers who have soil problems in cultivation Therefore, the researcher is interested in doing a project to study the properties of the soil in the cultivated area in order to develop a Web Application to analyze the soil quality that is beneficial for cultivation. From the field survey to check the soil quality in term of pH, Electrical Conductivity (EC), and soil moisture. It was found that the soil pH values for good crops were as follows: rice grew well at pH 5.75 ± 0.92 , cassava 6.75 ± 0.72 , rubber 5.80 ± 0.92 , sugarcane 5.70 ± 0.82 , and oil Palm 6.75 ± 0.72 . For the electrical conductivity (EC), it was found that the optimum EC value of rice was 2.85 ± 0.75 us/cm. Other crops such as cassava, para rubber, sugar cane, and oil palm have appropriate EC values as follows: 2.50 ± 0.53 us/cm, 3.50 ± 1.18 us/cm., 4.40 ± 0.52 us/cm. and 1.90 ± 0.21 us/cm. respectively. Soil moisture that provides sufficient water for the growth of various crops is rice 100.00 ± 0.00 %, cassava 38.50 ± 2.42 %, rubber 28.30 ± 2.91 %, sugarcane 27.00 ± 2.58 % and palm oil 28.00 ± 2.58 %. And the Web Application test that analyzes the soil quality that is useful in planting crops, found that just entering the soil pH, Electrical Conductivity (EC) and soil moisture in the Web Application can display information for farmers who are facing planting problems. and not immediately yielding, including suggestions for improving soil quality to have appropriate soil properties.

Introduction

Thailand is the world's major exporter of agricultural commodities and generates a lot of income for farmers. Thailand has an agricultural area of up to 149.25 million rai or 58,992.09 million acre. The Northeastern region is the most agricultural region and is considered the source of many economic crops in the country. Thailand faces many problems in soil management. Whether it is soil deficient, nutrient deficient and water deficient, and there are still many areas where the land has deteriorated in soil quality. Problems for cultivation are in every region of Thailand, be it the North, the Central, the Northeast and the South.

The Northeastern region is the region with the most problems with soil resources because it is a region with arid terrain that is not suitable for cultivation. This will make cultivation more difficult and farmers' income will also decrease. When incomes declined, there was no funding to do farming. Kalasin is faces such problems. Due to the fact that most of the soil is not suitable for growing vegetables and the current outbreak of the coronavirus, known as Covid-19 (Covid-19), has made farming many times more difficult. Due to the aforementioned problems, the organizers came up with an idea to apply scientific and technological knowledge to create a web application. Soil quality monitoring, as well as soil solutions suitable for that plant, with improvements and developments to make the data easy to use for easy access for the benefit of farmers who have soil problems in cultivation.

Objective

1. To study soil properties in local cultivated area.
2. To develop a Web Application to analyze soil quality that is useful in growing plants

Research question

- Can the Web Application analyze the soil quality that is useful for growing local crops?

Hypothesis

- Web Application can analyze soil quality that is useful in growing local crops.

Methodology

Project to study soil properties in cultivated areas for web application development, quality analysis Useful soil for growing local crops have studied relevant documents and research Therefore, the experiment was designed as follows.

3.1 Part 1 A comparative study of soil properties in plant plots

Measuring device

- 1) Soil test kit for testing soil pH and NPK elements model HI3896
- 2) soil moisture meter model DM-15 from TAKEMURA
- 3) Soil salinity meter, Smart brand, model 4in1 Soil Meter

Experimental method

1. Determine the study points and collect 10 general soil data by measuring soil properties, designing and collecting random samples for soil sampling. representing the area by selecting plants that are complete compared to Incomplete plant, stunted, 10 spots.

- Soil Moisture Measurement
- Salinity Measurement
- Soil pH Measurement

2. Analyze the data to find the relationship between plant growing sites and soil properties.

3. Fill in the information that you have in <https://www.globe.gov/globe-data/data-entry>

4. Compare complete plant information. and incomplete trees for the data to be designed Web Application

3.2 Part 2 Develop a Web Application to analyze soil quality that is useful for growing plants.

3.2.1 Website system Writing a website so that users can easily access information by the authors choose the language as follows.

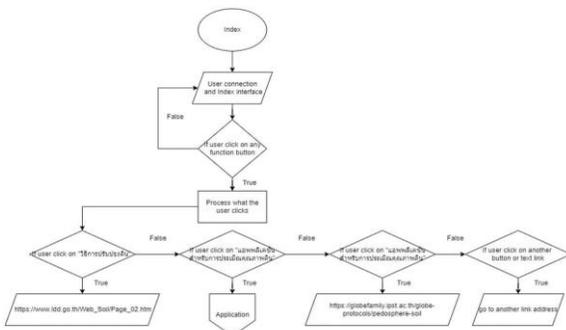
- JavaScript is a computer language for programming on the Internet.
- HTML is a form of computer language used to create web pages (Web Pages)

that have properties. Can link one web page to other web pages.

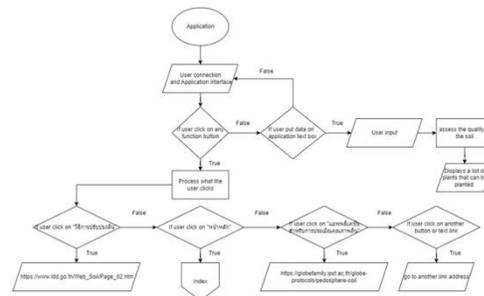
- PHP is a Script Language, the work process will translate every time someone call script

- SQL is a standard language for accessing databases. We can use the SQL language from the program. Various things that need to do with the database system, such as using SQL to retrieve data (Retrieve Data) from the database

- CSS is a language used to decorate HTML/XHTML documents to have a look, color, spacing, background, lines. Edge.



(1)



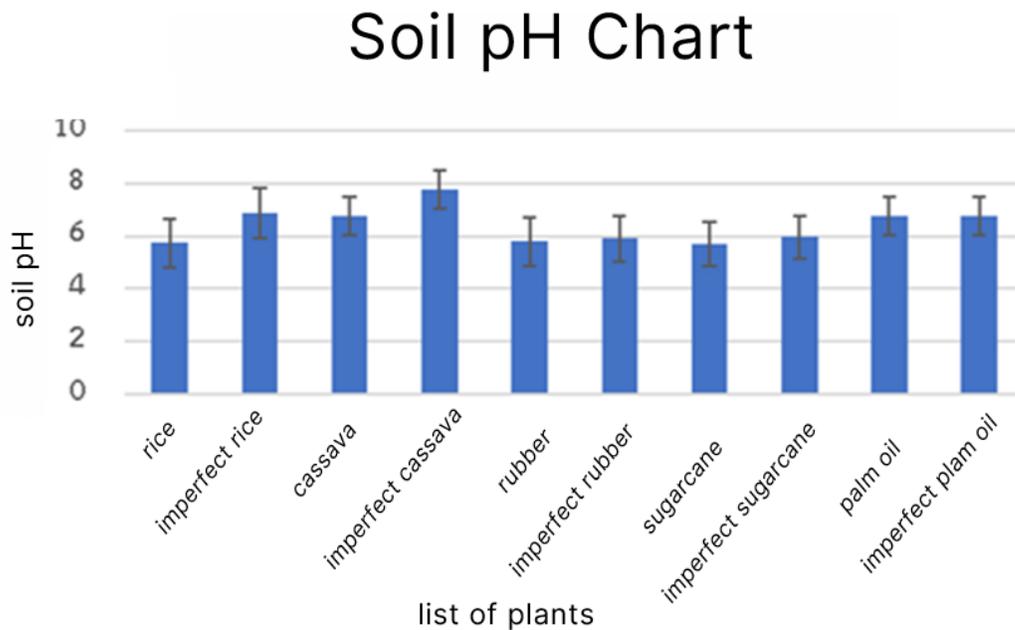
(2)

(1) When the user enters the website The system will display the home page of the website. After that, it will go into the condition "If the user clicks on any button", if true, it will process and display the output as the website or link that we have set. If false, it will return to the main page as before. Within this condition, if the user clips to "Application for Soil Quality Assessment", the system will retrieve the application file and display the application window that we have created. In addition to the folder of the main page.

(2) The principle of operation is that the system will display the application window of the website, after which it will enter the condition "If the user clicks on any button", if true, it will process and display the output as a website or link. If it is false, it will check in the next condition, "If the user enters a quality value soil into the site" will store data down to process After that it shows a list of plants that can be planted.

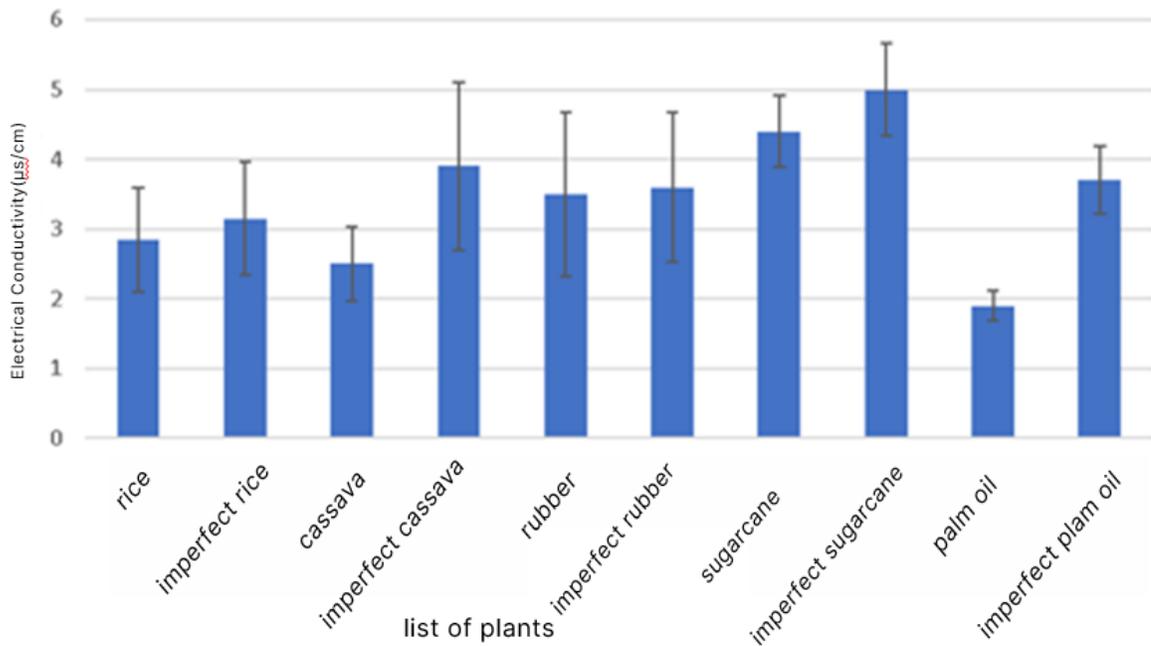
Results

4.1Part 1 A comparative study of soil properties in plant plots Designing and collecting random. soil samples representing the area by selecting the available plants. Completeness compared with incomplete plant, stunted at 10 points. From the soil properties measurement data, it was found that the soil properties in each measurement point were planted for each type of plant. especially the same plants but a complete beginning with an imperfect tree have different soil properties therefore analyzed Compare with the chart below.



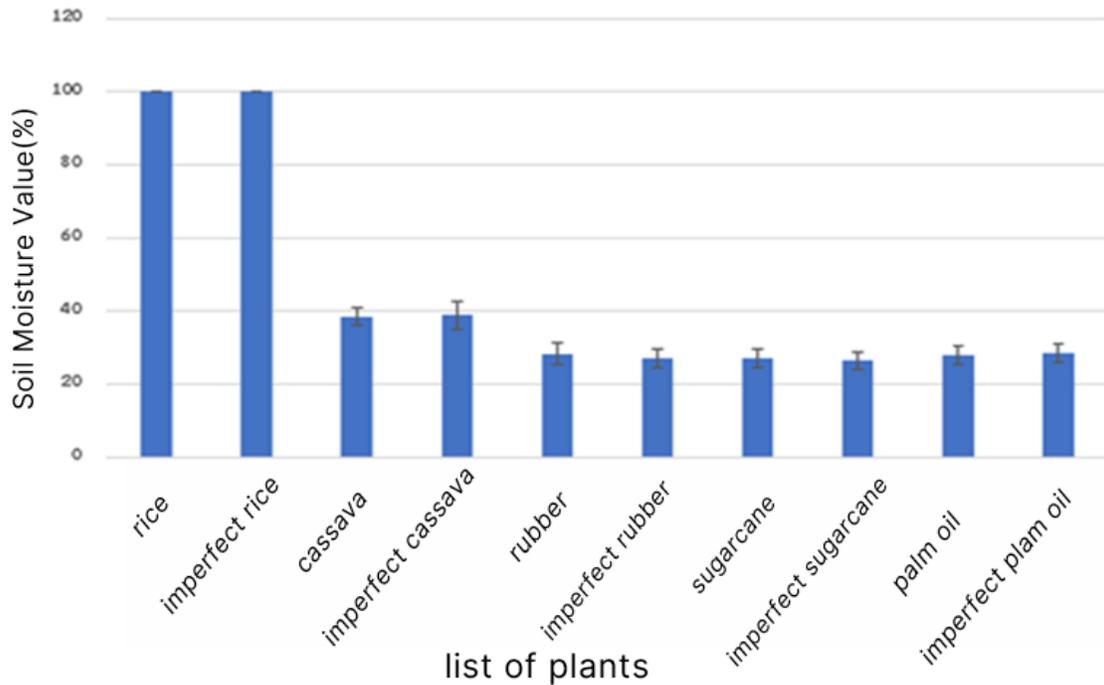
The chart shows the comparison of soil pH values and plants that can be grown at pH values. The acidic base of the soil yields complete and incomplete production. Rice grows perfectly at pH. The alkalinity of the soil pH is about 5.8, whereas the rice becomes incomplete when the soil pH is around 7.0 while the pH is 7.0, the cassava grows well, and when the pH rises to 7.8, causing the cassava plant to be incomplete Rubber and sugar cane grow well in soil pH. Approximately 5.8 and becomes incomplete when the pH reaches 6.0, however at a soil pH of approximately 7.0. Oil palm trees can be found in both imperfect and intact trees.

Soil Electrical Conductivity Chart



The chart shows the comparison of the EC salinity of the soil and the plants that can be grown at that salinity. The complete and incomplete output can be seen that The rice was fully grown at an average salinity of about 2.8 $\mu\text{s}/\text{cm}$. Meanwhile, rice will be incomplete when the average salinity is about 3.2 $\mu\text{s}/\text{cm}$, which is similar. It can grow at an average salinity of about 2.6 $\mu\text{s}/\text{cm}$, while cassava will become incomplete when The average salinity was about 3.8 $\mu\text{s}/\text{cm}$, which was the salinity of the cassava soil. incomplete and incomplete cassavaquite different Para rubber was fully grown at an average salinity of about 3.5 $\mu\text{s}/\text{cm}$ while Para rubber begins to be incomplete when the average salinity is about 3.6 $\mu\text{s}/\text{cm}$, which is very similar. sugarcane growing at the mean salinity of about 4.5 $\mu\text{s}/\text{cm}$, sugarcane was incomplete at mean salinity. Approximately 5.0 $\mu\text{s}/\text{cm}$, which is very close. while palm It was able to grow perfectly in the salinity. The average salinity is about 1.8 $\mu\text{s}/\text{cm}$, whereas the oil palm is incomplete at an average salinity of about 3.6 $\mu\text{s}/\text{cm}$. which the salinity in the soil in which the palm is planted The difference between complete and imperfect oils is quite large.

Soil Moisture Value Chart



The chart shows the comparison of soil moisture values and plants that can be grown at that moisture level. The complete and incomplete output can be seen that There was no difference in moisture content in rice fields 100% while the other crops, namely cassava, rubber, sugar cane, oil palm, have soil moisture content that can be grown. The difference between complete and incomplete was very little. It was found that cassava and water palm incomplete oil plants with high soil moisture than cassava and palm Slightly complete oil.

4.2 Part 2 Develop a Web Application to analyze soil quality that is useful in growing plants.

Once the soil properties have been measured in the local plant plots, the data can be entered into the system as follows.

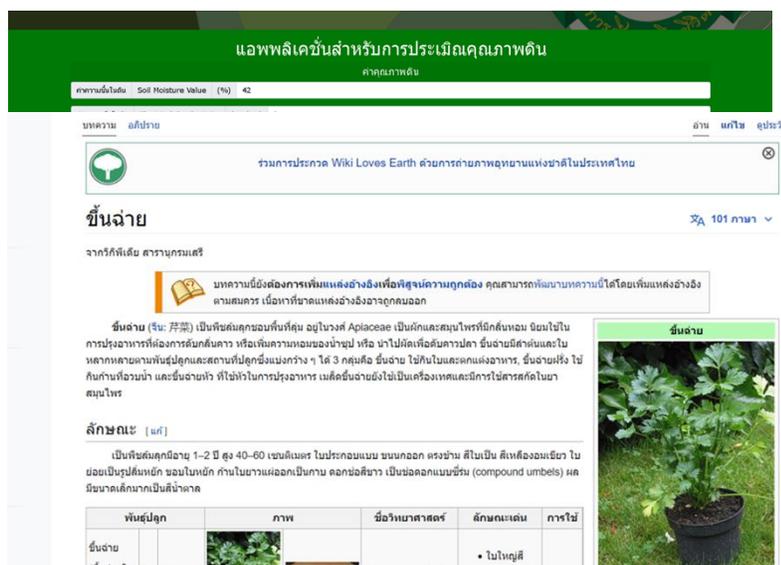
1. Web Application home page.



2. Fill in soil properties from the measurements.



3. A list of plants that can be be planted will appear.



4. When clicking on the list of plants There will be details about that plant as well.

5. There is a button in the upper right corner for providing information on soil quality improvement before planting and a button to tell how to measure soil.



6. Principle for conducting measurements according to the GLOBE method.



7. Soil management information website link.



8. Economic crops in Kalasin Province.

From testing the Web Application to analyze the soil quality that is useful in growing plants, can provide Information for farmers who are facing problems in growing crops and not yielding. including suggestions for improvement Soil quality to have appropriate soil properties as well.

Summary and Discussion

Comparison of soil pH values and plants that can be grown in soil pH values. get complete output Rice grew well at pH 5.75 ± 0.92 , cassava 6.75 ± 0.72 , rubber. 5.80 ± 0.92 sugarcane 5.70 ± 0.82 and oil palm 6.75 ± 0.72 . All plants grow well in saline soil.(EC) is suitable: rice grows well at the EC value of $2.85 \pm 0.75 \mu\text{s/cm}$, cassava $2.50 \pm 0.53 \mu\text{s/cm}$. Para rubber $3.50 \pm 1.18 \mu\text{s/cm}$, sugarcane $4.40 \pm 0.52 \mu\text{s/cm}$ and oil palm $1.90 \pm 0.21 \mu\text{s/cm}$. Soil moisture that can provide sufficient water for the growth of various crops is rice $100.00 \pm 0.00 \%$, cassava $38.50 \pm 2.42 \%$ Para rubber $28.30 \pm 2.91 \%$ sugarcane $27.00 \pm 2.58 \%$ and oil palm $28.00 \pm 2.58 \%$ Web Application testing, analyzing soil quality that is useful in growing plants, found that only Fill in the soil pH, salinity (EC) and soil moisture in the Web Application, it can be displayed. Information for farmers who are facing problems in growing crops and are unable to produce crops immediately. including suggestions for Improve soil quality to have appropriate soil properties.

Discuss the results of the experiment

Field data collected by Globe method yields soil pH, salinity (EC), and accurate soil moisture and covering the area can be a representative of the study area very well. Consistent with the information in the report of (https://www.ddd.go.th/Web_Soil/Page_02.htm) and when using data from both sources processed using Web Application, the soil quality can be analyzed whether it is suitable for. What kind of plants do you grow? Able to display plant types on the web page immediately. and from the link to the management website Soil enables Web Application to give advice to farmers to improve soil quality until it is also suitable for cultivating cash crops that farmers need.

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