Alkalinity of Soil Samples from Three Selected Areas in Rizal Province, Philippines in Relation to different Variables

[1,2]Carpio, John Perfect I., [1,2]Delas Alas, Trina Perpetua L., [1,2]Furio, Romar C., [1,2]Lascano, Mary Jane B., [1,2]Madredijo, Mary Joy R., [1,2]Magat, Camille Rose F., [1,2]Miguello, Leah Grace S.,[1,2]Ocampo, Raphael John A., [1,2]Ruiz, Kimberly Joan C., [1,2] Valderama, Christian James P.

Abstract-- The quality of soil depends on how it responds to different agricultural practices over a period of time. Different human practices and interaction increases the chance of making the soil unable to produce a good type of agricultural products. Furthermore, soil acidity affects the capability of the soil to abduct nutrients. Soil acidifies because of the viable element that triggers it's acidity to elevate. Nitrogen, Phosphorous and Potassium (NPK) are essential nutrient that makes up the plants to grow strong, enable the transfer of energy and prevent the water loss. This research envisions to determine the correlation of soil acidity and their NPK content. Samples were gathered from three strategic areas in Rizal Province, which includes Antipolo, Cainta and Taytay. The soil samples were submitted to Philippine Coconut Authority (PCA) Laboratory Services Division for analyses on pH level and NPK content by the use of UV-Vis Spectrophotometry for nitrogen, colorimetry for phosposrus and flame photometry for potassium. Results showed that there is no significant difference between the pH level and the NPK content of the soil samples. Moreover, the soil samples showed slight correlation on the pH and Nitrogen, high correlation on pH and Phosphorus and moderate correlation on pH and Potassium, respectively. In light with the findings, an action plan was crafted by the researchers for agricultural sustainability of Rizal Province.

Keywords-- *Soil acidity, NPK Content, Rizal Province, correlational study*

I. Introduction

ALKALINITY is the basicity of a substance ranging from 8-14 in the pH scale. In soil quality, it is one of the factors that affect the growth of plants. Alkalinity impairs plant growth by restricting water supply to the roots, thus obstructing root development results to phosphorus deficiency. It can affect the capability of the plant to absorb the desired nutrients for its growth specifically the Nitrogen, Phosphorus and Potassium (NPK). (*Dobermann and Fairhurst 2010*).

In plants, nitrogen is known as the primary responsible for vegetative growth. Nitrogen assimilation into amino acids is the building block for protein in the plant. It is a component of chlorophyll and is required for several enzyme reactions.

Phosphorus on the other hand is the major component in plant DNA and RNA. It is also critical in root development, crop maturity and seed production. Lastly, Potassium serves as a requirement for the activation of over 80 enzymes throughout the plant. It is important for a plant's ability to withstand extreme cold and hot temperatures, drought and pests. It increases water, use efficiency and transforms sugars to starch in the grain-filling process. However, the presence of Potassium is vital for plant growth because it is known to be an enzyme activator that promotes metabolism *(Back to Basics: The role of N, P, K and Their Sources by Jeff B., 2007)*. These are the essential nutrients that are needed by plants in order to produce agricultural products.

In the Philippines, there are provinces that have small agricultural land area yet produces large amount of crops in good quality, one of which is the Rizal Province. The province is accessible for agricultural development in consideration of climatic condition, and soil fertility. (*http://rizalprovince.ph/agriculture.html,2013*). It urged the researchers to conduct a study about the alkalinity of the soil in three selected areas namely, Brgy. Cogeo, Antipolo City (Urban), Brgy. Karangalan, Cainta (Suburban) and Brgy. San Juan Taytay (Rural) and its correlation to its NPK content.

II. Statement of the Problem

This study was conducted to correlate the alkalinity level and the NPK content of soil samples in selected three locales in Rizal Province.

1. What is the Alkalinity level of soil in the locale in Rizal Province namely;
    a. Antipolo (Urban)?;
    b. Cainta (Suburban)?; and
    c. Taytay (Rural)?
2. Which locality in Rizal Province has the highest pH content?
3. Which locality in Rizal Province has the lowest pH content?
4. What is the NPK content of soil in the locale in Rizal Province namely;
    a. Antipolo (Urban)?;
    b. Cainta (Suburban)?; and
    c. Taytay (Rural)?

[1]College of Arts and Sciences
[2]College of Education, The National Teachers College, Manila, Philippines.

5. What significant correlation exists between the alkalinity level and NPK content of soil samples in Rizal Province?
6. What is the significant difference between the NPK content and pH content of the soil samples in Rizal Province?
7. What agricultural program can be crafted based from the results that gathered?

III. HYPOTHESIS

The researchers pose the hypothesis that there is no significant correlation between the alkalinity level and NPK content of soil in Antipolo (Urban), Cainta (Suburban) and Taytay(Rural).

IV. SCOPE AND DELIMITATION

To accomplish this study, the researchers were required to collect soil samples in different parts of Rizal Province. These areas were: Antipolo (Urban), Cainta (Suburban) and Taytay (Rural). On the other hand, the researchers were not capable to do such soil sample analysis, thus, the researchers sought help to the experts. The samples were brought to the Philippine Coconut Authority (PCA) - Department of Agriculture, Quezon City. The results of the soil analysis from the PCA would be used for the formation of an agricultural program.

The following words were defined by the researchers. **Soil alkalinity** is a condition that results from the accumulation of soluble salts in soil samples which includes samples from Rizal Province. In this study, **pH** was used to express the acidity or alkalinity of the soil samples gathered from the three areas in Rizal Province. **NPK and pH** of the soil samples were analyzed quantitatively at the PCA Laboratory these variables were then tested for their correlation.

V. SIGNIFICANT OF THE STUDY

This research would determine the correlation between the alkalinity level and NPK content of the soil samples from the province of Rizal.

The study would also give light to the **Local Government Units (LGU's) of the Province of Rizal** because it might provide new information for the people to be informed on the soil quality of their area. The **Farmers of Rizal Province** may also be benefited on this research, because they can easily identify which area is suitable for planting agricultural crops. It can also help people to become aware of their environment and natural resources. The **future researchers** might use this as a spring board for a new research work that will be beneficial to the entire Rizal Province or on soil analysis.

VI. METHODOLOGY

The researchers coordinated with authorities and staff of the Philippine Coconut Authority (PCA), Laboratory Services Division to conduct the soil analysis. This was done by testing the pH level and NPK content of soil from three selected locale in Rizal Province. The Provincial Agricultural Office of Rizal assisted the researchers in gathering the soil samples.

The researchers collected soil samples from the three selected locales in Rizal Province particularly in Antipolo (urban area), Cainta (suburban area) and Taytay (rural area) which were approximately 250g and placed in an air tight plastic bags to secure it from contamination; they were then labelled. The soil samples were brought to the Philippine Coconut Authority (PCA) Laboratory Division for the soil analysis to test the pH level and NPK content of the soil.
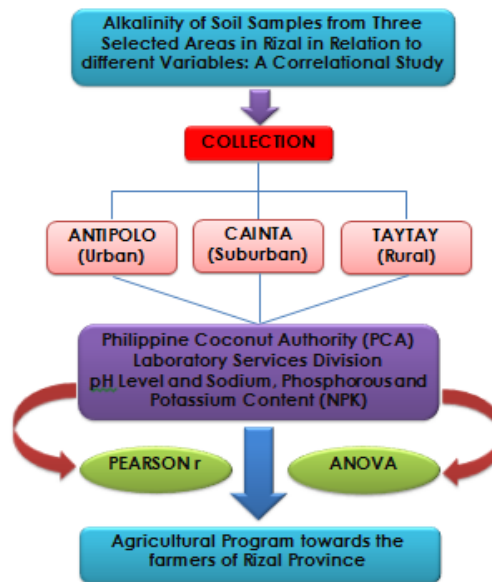

Fig. 1 Methodological Framework

Figure1 shows the process of the study wherein the researchers collected soil samples from different locale in Rizal Province. After collecting the samples, the researcher brought the samples to the Philippine Coconut Authority (PCA) to determine the alkalinity level and NPK content of the samples. Afterwards, the researchers interpreted the results using Pearson-r and ANOVA as statistical tools to determine the correlation and significant differences between the alkalinity level and NPK content of the soil samples from the said areas of concern. Lastly, for the recommendation, the researchers crafted an agricultural program towards the farmers of Rizal Province.

VII. TREATMENT OF DATA

The gathered data were subjected to statistical treatment to further understand the result and variation of the elements. It is also done to show if there is no significant correlation and no significance differences between the alkalinity level and NPK content of soil in different areas in Rizal Province.

The Pearson-r and ANOVA were used as statistical tools for computing the variation and significant correlation between the alkalinity level and NPK content of the soils.

VIII. RESULTS AND DISCUSSION

The results were given by the Philippine Coconut Authority showing the pH and NPK content of soil from three selected areas in Rizal Province.

TABLE I
pH and NPK CONTENT OF SOIL SAMPLES

Soil Sample	pH	Nitrogen (%)	Phosphorus (ppm)	Potassium (meq/100g)
Urban	6.7	0.078	40.3	0.212
Suburban	6.9	0.187	28.0	1.655
Rural	5.7	0.066	14.1	0.233

Table 1 shows the pH and NPK content of soil samples from different areas in Rizal Province. **Urban** (Antipolo, Rizal) has 6.7 pH, 0.078 nitrogen (N), 40.3 phosphorus (P) and 0.212 potassium (K). **Suburban** (Cainta, Rizal) has 6.9 pH, 0.187 nitrogen (N), 28.0 phosphorus (P) and 1.655 potassium (K). **Rural** (Taytay, Rizal) has 5.7 pH, 0.066 nitrogen (N), 14.1 phosphorus (P) and 0.233 potassium (K).

TABLE II
TEST OF SIGNIFICANT DIFFERENCE ON THE pH AND NPK CONTENT OF THE SOIL SAMPLES

Test variables	Sum of Squares	df	Mean Square	F	Interpretation
Between Groups	93.967	2	46.983	.243	Not Significant
Within Groups	1737.202	9	193.0222		
Total	1831.168	11			

The researchers found that there is no significant difference between the pH and NPK content of soil in different areas in Rizal Province. The null hypothesis is accepted since the computed value is 0.243 and the level of significance is 0.789.

TABLE III
TEST OF CORRELATION OF THE pH OF SOIL SAMPLES on THE NPK

Factors	R Value	Interpretation
pH and N	0.032	Slight correlation
pH and P	0.80	High correlation
pH and K	0.62	Moderate correlation

Table 3 shows the test correlation of the pH of soil samples on the NPK. pH and N has 0.032 *r* value that is slightly correlated, pH and P has 0.80 *r* value that is high correlated and pH and K has 0.62 *r* value that is moderate correlated.

IX. CONCLUSION AND RECOMMENDATION

From the data which had undergone statistical treatment, it has been showed that the hypothesis be accepted, which suggest that there is no significant correlation between the alkalinity level and NPK content of soils in different areas in Rizal Province.

In light with the findings of the research the researcher made the following recommendations; (1) further studies about the correlation of NPK content and pH level Rizal Province. (2) Establish an agricultural campaign that gives information about the importance of monitoring the pH level and NPK content of the soil. (3) Gather more soil samples to validate the variety of the research results.

X. ACKNOWLEDGEMENT

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