GLOBE PROJECT – Pedology

Determining soil characteristics for a successful school garden

Primary school “St. Cyril and Methodius
N. Macedonia

Introduction

Why is a soil test important and what is the purpose of our research?

A soil test is important for several reasons:
-to optimize crop production,
-to protect the environment from contamination by runoff and leaching of excess fertilizers,
-to improve the nutritional balance of the growing media and to save money and conserve energy by applying only the amount of fertilizer needed,
-to reducing the risk of over application that can lead to nutrient runoff and water pollution.
This helps maintain water quality and protects aquatic ecosystems. In summary, soil testing contributes to environmentally friendly farming practices, preserving soil health, water quality, and biodiversity.

When we began with forming a school garden in our school yard in v. Logovardi, because of all ecological benefit, we came to idea that it’s for the best if we at first perform a soil typification. Using GLOBE's protocol for soil research - pedosphere, we measured some of the parameters and have done soil typification.

These activities helped us learn more about the soil and correctly decide which plants to grow.

- A description of our school garden and research

Why this research?

We are doing this research because we are building our school garden in Logovardi.

The purpose of our garden is to acquire skills, get acquainted with the process of growing vegetable crops and do organic farming without pesticides.

This will help to save the environment and encourage local farmers to reduce use of pesticides.

If we can do it, they can do it.

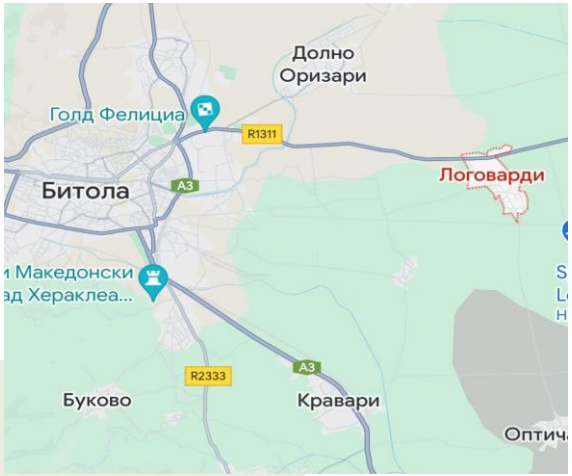
- Question:

What is the soil like in our school garden?

4. Determination and description of the research site

Logovardi

- Logovardi is a village in the near end of the eastern part of Bitola, located in the **Bitola Field** which is a part of **Pelagonia,**the largest basin in Macedonia.
Our research took place in the courtyard of the regional elementary school "St.Cyril and Methodius", in Logovardi.



When?

-Beginning, unfolding

The beginning of the research, that is, the first examination was to determine the soil type and was held on December 14, 2023. This is a winter period, so when the first examination was carried out around there was also a small amount of snow. Then the tests continue with once a month monitor soil temperature and pH examination.

- ***Necessary materials***: GLOBE kit for pedosphere, markers, meter, thermometer, pH meter, acetic acid, electronic scale, metal can, laboratory cases, water.

5. A short walkthrough of our soil experiment

➪ ***Determining a measuring point***

We stationed in the backyard of the school in Logovardi and we marked the spots that we examined in a shape of a star. As shown on the pictures we put up orange flags on the site. And shortly after we began our observations.

➪ ***Temperature measurement with a soil thermometer***

At first we measured the temperature of the soil. We dug a small hole in the soil and put in the thermometer. We measured from the depth of 5cm and then from the depth of 10cm using a mercury thermometer. The first result was 1°C and the second was 2,5°C.

➪ ***Determination of carbonates in soil***

After we measured the temperature, we began to prepare for the next observation, which was the carbonates test. We dug a slightly deeper hole and began to pour vinegar into the hole. We waited for a while to see if the mud we created would start to bubble, to indicate sings of carbonates in the soil. In fact it didn't bubble at all, meaning there was no carbonates in the soil.

➪ ***Observing the presence of vegetation, structure and consistency of the soil***

Then we began with identification of the soil type we were working with and defining its name. The soil was **shrew and didn’t easily crumble**. It was **fine-grained and humid**. There were a few roots and small branches in the soil. We used the Munsell Notation diagram to identify the shade of the soil.

➪ ***Determination of soil color according to Munsell Notation***

➪ *Laboratory determination of soil pH value*

We took a sample back to our school laboratory. We dissolved part of the sample in some water and let it settle and measured the pH value of the dissolved soil. Our pH meter showed a value of 7,1 pH.

➪ *Determination of soil moisture by gravimetric method*

We measured the mass of the soil sample, then allowed it to dry and reweighed the mass of dry soil. Using the data, we calculated the soil moisture:

weight of dry soil – 133,3g
weight of can – 52,6g
weight of dry soil in the can – 185,9g
weight of humid soil – 179,6g
weight of humid soil in the can – 232,2g

179,6g – 133,3g = 46,3g
133,3g – 52,6g = 80,7g
46,3g: 80,7g = 0,57
0,57 · 100 = ***57%***

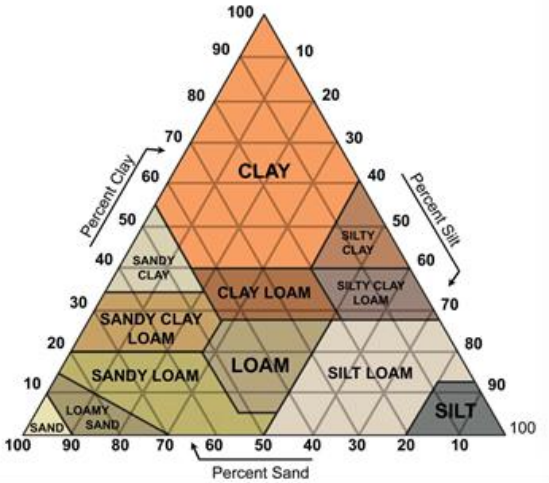
➪ *Determination of soil texture by three-component diagram*

With the leftover soil we did one last observation, which was typification, which is the process of identifying the soil's name by texture and layers. First we broke up the soil into small particles and put it in a glass. Then we poured warm water into the glass. We let it sit for an hour to see how the water would divide the layers of the soil. In the first hour we came to the conclusion that the soil had no sand. We let it sit for a day and these were the results:

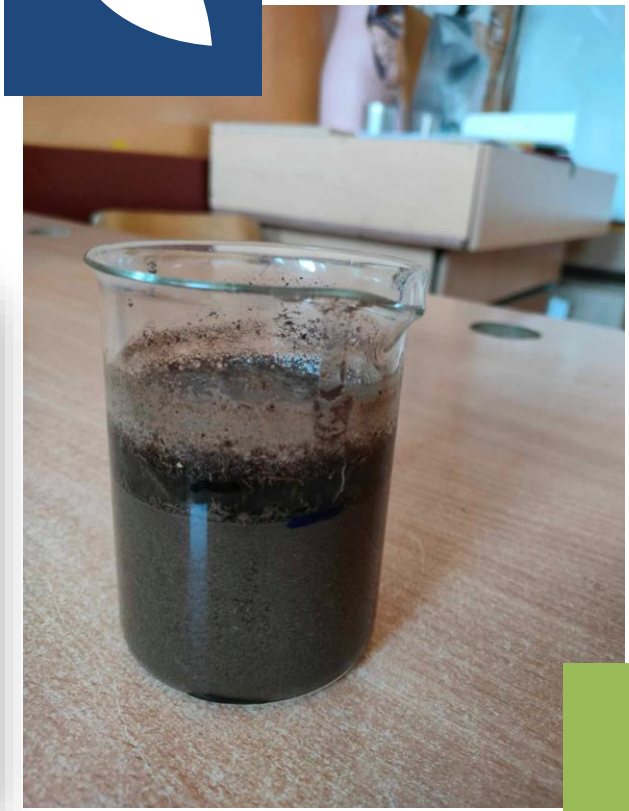
sand – 0mm
silt – 47mm
clay – 9mm

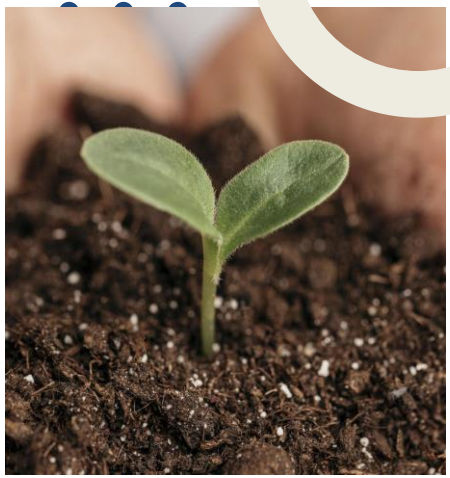
sand + silt+ clay = ..% ⇒ 0+47+9 = 56

% sand = 0: 56 x 100 = 0%
%silt = 47: 56 x 100 = 83,9%
% clay = 9: 56 x 100 = 16,07%



This classifies our soil in the ***silty loam*** type of soils.





Conclusion of our experinemt

-***Why is this experiment so important?***

In our case, through the performed experiments, we determined the GLOBE protocol that the soil is of the **silty loam type**, with a pH value of 7.1, without carbonates and humidity of 57%. This means that it is best to plant grain, wheat, corn, poppy, cotton, sunflower, sugar beet.
Soil testing and typification are crucial for understanding the characteristics of soil in a specific area. This information helps in optimizing agricultural practices by determining nutrient levels, pH, and other factors that influence plant growth. It allows farmers to make informed decisions about fertilizer usage, irrigation, and crop selection, ultimately enhancing productivity and sustainability. Additionally, soil typification aids in classifying soils based on their properties, providing valuable insights for land-use planning and environmental management.

Harvesting our school garden

- After we have done soil typification we started our winter farming. Because of the low temperatures and conditions at first we planted garlic, onions and lettuce.
- Also we plant some seasoning herbs like basil, lavender and thyme
- In spring we will plant tomatoes , peppers and cucumbers.
- There is no need for adding fertilizer because the soil is fertile and filled with humus. If it is necessary we will add natural fertilizer for plants from local farms.

Our onions and lettuce are growing very well

Thank you for your attention!

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