

# SOIL FERTILITY STATUS IN TIDAL LAND OF TIRTOMARTO RESERVOIR CENTRAL JAVA, INDONESIA

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## Abstract

Reservoir tidal land used for agriculture is generally done when the reservoir water level begins to shrink. This land is used as a moor in dryland or lowland rice field in the wetland. The purpose of the study was to determine the soil fertility status of the tidal land of the Tirtomarto Reservoir, Central Java. Parameters tested include cation exchange capacity (CEC); base saturation (BS); C-Organic; total soil P and K levels according to the technical instructions for evaluating soil fertility. Soil samples were taken from three location points by the purposive sampling method. The results showed that most of the soil samples contained low to very low nutrients, except for the total P content which had a high value. Therefore, the fertility status in the tidal land of the Tirtomarto reservoir, Central Java, can be categorized as low. The low fertility status of the soil at the study site was due to the limiting factors, namely the low C-organic content of the soil, low K total soil, and low cation exchange capacity and base saturation.

## Introduction

- ❖ Reservoir tidal land are formed from reservoir sedimentation and during the rainy season, they will always be submerged in water. The state and nature of tidal reservoirs are different from those on the coast. Reservoir tides are annual tides resulting from fluctuations in reservoir water level. This land will dry up and open up as the reservoir water shrinks. This opportunity is used by farmers to expand their agricultural land by utilizing land at the bottom of the reservoir and close to the reservoir water source. This of course will result in differences in the quality and characteristics of tidal land with irrigated land or dry land which is commonly known by farmers.
- ❖ The properties and characteristics of tidal land include inundation, peat layer, sulfidic material which, when oxidized, will lower the soil pH to very acidic, followed by the appearance of toxic substances (Al and Fe), high salinity (seawater intrusion), and low soil fertility and in dry conditions in the dry season there will be a process of pyrite oxidation in the soil-forming sulfate compounds which can lower the soil pH to very acidic. While the social aspects are the low level of education, limited manpower, capital, and facilities.
- ❖ Based on the nature and characteristics of the tidal land, it can be concluded that one of the obstacles faced in agriculture in tidal land is the low level of land fertility. There are five soil fertility parameters used in this study to assess soil fertility status, namely CEC; BS; C-organic; P and K levels of total soil according to technical guidelines for evaluating soil fertility. This study aims to determine the status of soil fertility in the tidal land of the Tirtomarto reservoir, Central Java, Indonesia.

## Research Methodology

- ❖ The research was conducted in September to November 2019 in the tidal land of the Tirtomarto Reservoir. The research location is in Delingan Village, Karanganyar District, Karanganyar Regency, Central Java Province. Tirtomarto reservoir is located at coordinates 070° 35' 17.94" South Latitude and 1100 59' 11.56 East Longitude at an altitude 237 meters above sea level.
- ❖ The research includes two main activities, namely soil sampling and soil analysis in the laboratory. Soil samples were taken using random and purposive sampling methods. The soil was taken at a depth of 0-30 cm (topsoil). Three sampling locations represent five sub-samples to then be composited into soil samples. The point of collection location is adjusted to the distance of the point from the area that is still inundated. This is because areas that are still inundated have an increased fertility rate due to the accumulation of nutrients due to water immersion

## Result and Discussion

Table 1. Soil Fertility Status Classification of Tidal Land Tirtomarto Reservoir

Sample Code	CEC (Cmol(+)/kg)	Base Saturation (%)	C-Organic (%)	Total P (mg/100g)	K-Total (mg/100g)	Fertility status
Point-1	15.03	24	1.69	54	0.45	Low
Point-2	17.62	37	1.42	47	1.01	Low
Point-3	11.39	31	1.63	43	1.26	Low

## Result and Discussion

- ❖ Generally, tidal reservoirs have a topography in the form of soil conduction with various slopes. With the existence of tidal and low tide movements in the reservoir, this area will become an increasingly sloping area. Soil is defined as a material consisting of aggregates (granules) of solid minerals that are not cemented (chemically bonded) to each other and from decayed organic matter. The soil at the bottom of the reservoir is the result of deposition from the accumulation of suspended materials that enter along with the flow of reservoir filling water.
- ❖ According to the National Land Agency of Karanganyar Regency, the type of soil in Karanganyar District is included in the latosol soil category. This also applies to the soil in the tidal land of the Tirtomarto Reservoir, because before the reservoir was built, the original land was of the latosol type.
- ❖ The results of the soil texture analysis showed that the soil texture in the tidal land of Tirtomarto Reservoir was clay texture. The characteristics of clay textured soils are >35% ability to store water and high soil nutrients, the existing water is absorbed with high energy, so the availability of water is sufficient for plant needs.
- ❖ The low fertility status of the soil at the study site was due to the limiting factors, namely the low C-organic content of the soil, low K total soil, and low cation exchange capacity and base saturation. The content of C-organic (organic matter) in the soil greatly affects the ability of the soil to maintain soil fertility and productivity through the activity of soil microorganisms. The effect of organic matter on chemical properties is that it can increase the negative charge so that it will increase cation exchange capacity. Organic matter makes a significant contribution to soil CEC. As much as 20-70% of soil exchange capacity generally comes from humus colloid so that it can be correlated between organic matter and soil CEC. The effect of organic matter on biological properties, namely the addition of organic matter can increase the activity and population of microbiology in the soil, especially those related to the activity of decomposition of organic matter. Organic matter can also increase the base saturation of the soil. Organic matter in the form of hummus has a negative charge that can bind K+ so that the potential for potassium to undergo leaching is lower. The pH setting for pH that is classified as acidic and slightly acidic can be increased so that the bases that can be absorbed by plants can turn into available forms. Soil fertility is very important to know because it shows the ability of the soil to provide nutrients for plant growth.

## Conclusion

In general, the status of soil fertility in the Tidal Land of the Tirtomarto Reservoir is low. Special treatment is needed such as fertilization and addition of soil nutrients so that they can be utilized for optimal agricultural land development. However, it should be noted that the tidal land is located within the reservoir area so it does not neglect the operational continuity of the Tirtomarto Reservoir.

## References

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