I. INTRODUCTION

1.1. Background

Soil functions as a medium of growth and a source of nutrients for plants. Phosphorus is one of the essential macronutrients in soil that plays an important role in plant growth and production. Phosphorus plays a role in the processes of photosynthesis, respiration, and in the transfer and storage of energy. In addition, phosphorus contributes to cell division and growth as well as various other processes within plants. The availability of phosphorus in the soil is influenced by various things, one of which is the difference in the type of land use. Variations in land use have a significant impact on the properties of phosphorus in soils. Phosphorus in the soil is not only influenced by natural processes such as mineral weathering but is also influenced by human activities through planting patterns, plant types, and land management practices. These differences in land use directly affect the availability of (Sigh *et al* ., 2021) (Happy *et al* ., 2022) (Lisdiyanti & Guchi, 2018) soil phosphorus both in its total form and in the form that can be absorbed by plants.

Based on data, the total agricultural land in Wonosalam District is approximately 12,163 hectares. Agriculture in Wonosalam sub-district features various land uses. Common land use types in Wonosalam District include monoculture, agrosilviculture, intercropping, and agrosilvopasture. This variety reflects the diverse agricultural practices in the area aimed at increasing productivity and land sustainability. Vegetation varies with different land uses in Wonosalam. Monoculture systems tend to have uniform vegetation and consistent plant density, while agroforestry and agrosilvopasture systems support more diverse vegetation with different levels of density. Central Bureau of Statistics (2023)

Parjono (2019) explained in his research that the more covered a land (vegetation density), the higher the soil phosphorus content compared to open land. This shows that vegetation plays an important role in increasing the availability of nutrients, especially phosphorus, which is essential for plant growth. The research conducted by provides empirical evidence regarding the impact of the application of agroforestry systems on soil phosphorus content. In the experiment conducted, it

was found that the application of the agroforestry system was able to increase phosphorus levels from 5.57 mg/kg to 8.93 mg/kg. This significant increase can be attributed to the presence of denser and more complex vegetation in agroforestry systems that contribute to increased phosphorus availability through processes such as uptake by plant roots, decomposition of organic matter, and symbiotic interactions with soil microorganisms. Fahruni (2017)

Each land-use model affects the availability of nutrients in the soil in different ways. Therefore, this study aims to analyze the P element in various land use models and how the difference in land use affects the chemical properties of the soil supporting phosphorus elements such as pH, Cation Exchange Capacity (KTK), Organic Carbon Content (C-Organic), Al-dd & H-dd. This study includes a comparison of the observed land use differences (monoculture, intercropping, agrosilviculture, and agrosilvopasture) to phosphorus values. The results of this study are expected to provide information on the most superior land use in the availability of phosphorus nutrients in the soil. This research contributes to efforts to maintain soil fertility and the sustainability of agricultural systems in the future. (Liana *et al* ., 2022)

1.2. Problem Formulation

1. Does the difference in land use type affect soil phosphorus status?
2. What is the pattern of differences in soil phosphorus status between monoculture, intercropping, agrosilviculture, and agrosilvopastura systems in Wonosalam District?
3. Which land-use system contributes the most to increasing soil phosphorus availability?

1.3. Research Objectives

1. Examining the influence of land use type on soil phosphorus status in Wonosalam District, Jombang
2. Comparing soil phosphorus status between different types of land use
3. Identify the land-use systems that contribute most to increasing soil phosphorus availability

1.4. Hipotesis

1. Differences in land use types have a significant effect on soil phosphorus status
2. Monoculture land use types have the lowest contribution to soil phosphorus status
3. Agrosilvopastura has the lowest contribution to soil phosphorus status