Title : Determination of Soil NPK using Spectrophotometry and Flame Photometry

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ABSTRACT

Doi Saket District, in Chiang Mai Province, is an important agricultural area in Northern Thailand, characterized by diverse crop cultivation and extensive farming activities. However, the region faces increasing challenges to agricultural sustainability due to soil degradation and inefficient nutrient management. This study aimed to evaluate the fertility status of agricultural soils in Doi Saket District by quantifying the concentrations of primary macronutrients: nitrogen (as nitrate, NO_3^-), phosphorus (P), and potassium (K).

Soil samples were systematically collected from representative agricultural sites and analyzed using spectroscopic techniques. Nitrate and phosphorus concentrations were determined via UV–Visible spectrophotometry using colorimetric methods—specifically the cadmium reduction method for nitrate and the molybdenum blue method for phosphorus. Potassium levels were measured using flame photometry based on atomic emission principles. Standard calibration curves were constructed to ensure analytical accuracy and reliability. The results revealed spatial variation in soil nutrient distribution across the district. Certain areas exhibited nitrate deficiency, while phosphorus accumulation was observed in specific locations. Potassium levels were generally within ranges suitable for crop production. These findings provide a scientific baseline for precision fertilizer management, supporting improved crop yields and minimizing environmental impacts associated with excessive fertilizer application.

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