

MAPPING SOIL FERTILITY AND FERTILIZER REQUIREMENTS

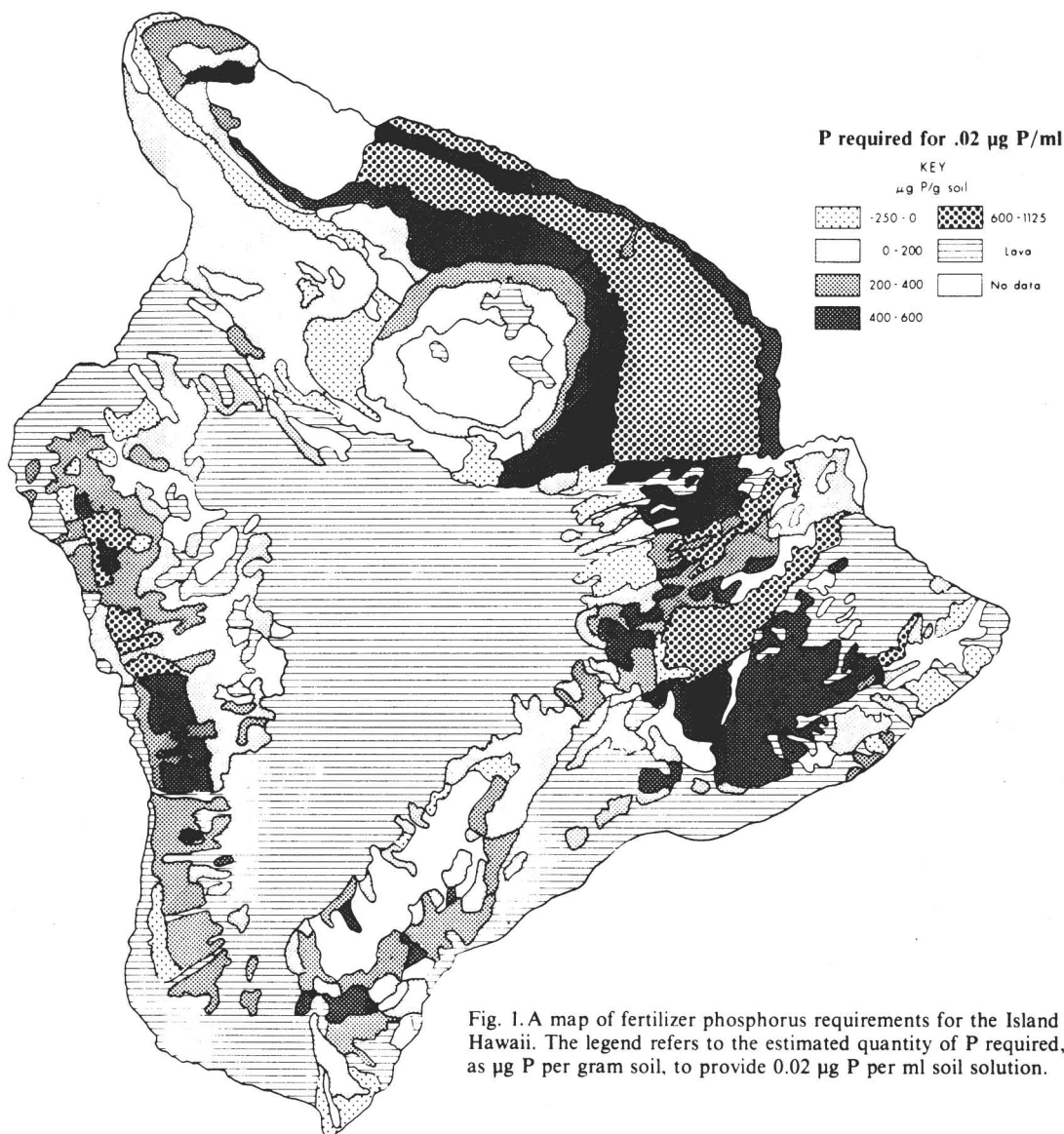


Fig. 1. A map of fertilizer phosphorus requirements for the Island of Hawaii. The legend refers to the estimated quantity of P required, as µg P per gram soil, to provide 0.02 µg P per ml soil solution.

Soil classification schemes and soil surveys attempt to group soils that have similar properties or require similar management. Such groups are usually based on features that can be recognized in the field, such as land form, drainage, vegetation, parent material, and soil profile characteristics. Soil map users assume that the soil properties that are important for their purposes are among the criteria used for classification and survey, or, if not, that the two are correlated.

Following this logic, if the surveyor's criteria are highly correlated with a particular soil property, such as phosphorus adsorption, it will be possible to construct phosphate fertilizer requirement maps of any area for which soil survey maps and phosphate sorption curves are available. Such maps assume that P fertilizer requirements are related to P sorption by soils. Maps constructed in this way have only general applicability. They will fail to the extent that soils of particular sites have been altered by management practices, such as fertilizer use, so that P requirements for those sites no longer correspond to the general requirements determined for that kind of soil.

The relationship between the way soils are grouped in the Hawaii Soil Survey and P sorption properties demonstrated a high degree of correla-

tion. About 53% of the variation in the quantity of P required to establish 0.02 µg P/ml was explained by the soil great group that the sample represented. The percentage of variation explained increased to 65% if soil mapping units were the basis for comparison.

The map presented here is based on soil samples from the most important soils on the Island of Hawaii. Most soils were represented by several samples.

Soil samples in suspension were reacted with various quantities of P. The concentration of P remaining in solution was determined, and P sorption by the soil was calculated. Phosphate that disappeared from solution was assumed to have been sorbed.

The map represents the quantity of P needed per gram dry soil in order to establish 0.02 µg P/ml in solution, a concentration that is adequate for near-maximum yields of many agronomic crops. Quantities of fertilizer required can be calculated from the quantity of soil that will be fertilized.

Many soils on the Island of Hawaii are rocky and almost all of the rest have low bulk densities. Calculated fertilizer requirements should take these properties into account. Thus the requirements for these soils will not be so great as the legend suggests.