Tropical Soils: Enhancing Crop Production

The Need: Food crop production in about 25 percent of the land area in the tropical regions of Africa, Asia and Latin America is limited by either soil acidity or phosphorus deficiency. Cereal crops production also suffers from widespread nitrogen deficiencies. Fertilizers, lime and the soil and plant analytical services to diagnose nutrient problems and recommend corrective measures are more expensive in the tropics than in many temperate regions. In many tropical regions, existing lime and fertilizer recommendations are based on general principles of crop needs and have not been fully tested or adjusted for differences among crops, cultivars or local soil types.

Serving the Need: From 1997 to 2002, College of Agriculture and Life Sciences Soil Science Department faculty and faculty at four other U.S. universities (Cornell, Colorado State, Hawaii and Texas A&M) developed a soil nutrient management support system called NuMaSS. The software assists users to diagnose nutrient problems, recommend lime and fertilizer needs and evaluate the economic viability of recommended inputs for 16 different grain, tuber crops and forage grasses and legumes commonly grown in the tropics.

During the last four years, Soil Science Department faculty and collaborators at Texas A&M worked with national and international institutes in Bolivia, Brazil, Costa Rica, Ecuador, Honduras, Mexico, Nicaragua and Peru to refine NuMaSS coefficients for regional soil types and locally used varieties of corn, cowpea, cassava, cotton, potato, sorghum, soybean and rice grown in each region. As a final step in regional adoption of NuMaSS, collaborators are conducting on-farm tests to compare lime and fertilizer recommendations by NuMaSS with their previous and long-standing regional formulas. Each test compares both yields and total fertilizer input costs.

Impact beyond North Carolina: International user responses to the software have been positive and highlight the following benefits relative to fertilizer management based on their regional formulas.

- NuMaSS recommendations achieve targeted yields but with less fertilizer.
- NuMaSS economics allow the comparison and selection of the cheapest fertilizer nutrient sources.
- NuMaSS accounts for nutrient inputs from locally available organic sources.
- NuMaSS reduces field agent reliance on soil testing labs for fertilizer recommendations.
- NuMaSS enables fertilizer dealers to make marketing decisions based on local needs.

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