addition, it will help to pinpoint the strengths of these assessments.

Ground Water Vulnerability Assessment provides a useful reference for those involved in making management decisions. If followed, the text provides a basic guideline for this process. This report is designed to be of use to those who develop techniques for assessing vulnerability and the science that supports these techniques. The report includes guidance for making informed judgments on whether an assessment provides the necessary information to be useful in the decision-making process and how the assessment might be lacking. This text addresses only contamination resulting from point source emissions or aerially distributed point sources of pollution and does not address individual point sources of pollution nor any situation where a pollutant is purposely placed into the groundwater system. —DAVID D. BOSCH, Southeast Watershed Research Laboratory, USDA Agricultural Research Service, Tifton, GA 31793.

Adaptation of Plants to Soil Stresses


This is the proceedings of a workshop held at Lincoln, NE, from 1 to 4 Aug. 1993, cosponsored by USAID, INTSORMIL, and the University of Nebraska, Lincoln. It contains 20 papers in areas such as plant breeding, soil science, stress physiology, economics, and biotechnology. A recurrent theme is that of tailoring crops to soils to produce sustainable agricultural systems rather than continuing solely with tailoring of soils to crops instead. Such tailoring is repeatedly envisioned as a well-targetted, carefully conducted, truly cooperative (interdisciplinary) breeding effort, including mechanisms for collaborating-scientist recognition at the time of germplasm or cultivar release.

Greatest emphasis of the papers included in the workshop is on the selection of breeding lines for acid-soil tolerance, with less attention to drought and salinity stress, low-fertility (particularly with respect to P) settings, and toxic metals-impacted sites. An informative section on successes in crop-breeding programs to alleviate soil stresses is included, with examples of a maize program for the acid savannah (Cerrados) region of Brazil, a sorghum program for an acid-soil region of Colombia, a rice-breeding program for the Philippines and elsewhere throughout southern Asia, and an acid-tolerant wheat program for portions of northern Canada. Examples from other sections of the book relate to the Sahel region of west-central Africa, and to arid and acid-subsoil regions of the USA.

Emphasized thoughout are the importance of properly selecting the screening criteria for use, including assurances that solution-culture screening (if used) correlates adequately with soil-based responses, and selection of realistic toxicity or deficiency thresholds in light of anticipated crop-growth settings. Some examples of multiple-stress avoidance or tolerance mechanisms (e.g., deeper-rooting cultivars with acid-subsoil tolerance, which also alleviate midseason drought stress) are given for selected genotypes as well, though the authors acknowledge that this is often a serendipitous result.

Interesting "nuggets" scattered throughout the book include claims or observations that:
1. Adapting corn and wheat to 3°C colder mean annual temperatures could potentially access 80 to 90 million ha of additional land for each crop in northern Europe, Asia, and America, along with corresponding benefits for other crops (if similarly modified) for the Andean valleys of South America and the highlands of Africa.
2. Crop and cultivar selections for adverse soil-stress conditions frequently result in cultivars with less ability to respond to the somewhat higher-input levels that may remain desirable from an economics viewpoint.
3. Current average crop yields worldwide represent less than 25% of the genetic potential as determined by yield records, with the major cause of yield reductions attributed to drought and with biotic factors including insects, diseases, and weeds being responsible for losses representing <20% of the potential yields of most species.
4. Soil temperatures at depths greater than 20 cm, and CO₂ concentrations in the plow layer and at deeper depths, often critically affect both root growth and genetic root-system expression.
5. 82% of the land area of the American tropics is P-deficient in its natural state.
6. Aluminum-tolerant cultivars grown on acid mine spoil may convert insoluble or unavailable P to organic forms that are then available to plants that may be more metals-sensitive but also potentially more profitable.

The book ends with a discouraging but still hopeful assessment of recent trends in funding for collaborative international agricultural research, and the hope that the Rio accords of 1983 may lead to substantially improved support for sustainable agricultural-systems research (particularly that with increasing environmental or ecological emphases). —B.L. McNEAL, Department of Soil and Water Science, University of Florida, Gainesville, FL 32611.

Decision Tools for Pest Management


Farming systems management, irrespective of the farm size, is becoming increasingly complex to remain profitable while adjusting to a broad-based concern for agricultural land use and sustainability. Because integrated pest management (IPM) conforms to the general concepts of sustainable agriculture, and because widespread use of pesticides in the past has led to environmental and health degradation, the need for effective and sustainable pest management is growing constantly. However, the multidisciplinary nature of IPM and its dependence on a dynamic agroecosystem make its implementation a challenge to both farmers and their advisors.

Realizing this, the authors of Decision Tools for Pest Management have put forth a pragmatic approach, in their words, a "problem-based" approach to implement IPM strategy. In essence, they have formulated a "working model or concept" by applying the principles and techniques of decision analysis theory. It is a process in which potential solutions and alternatives to a well-defined problem are compiled from existing