DIAGNOSIS AND IMPROVEMENT OF ACID SOILS

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PREFACE

The largest reserves of potential arable land still available in the world are acid soils. Acid soils, estimated at more than 800 million ha worldwide, constitute from

40-50% of potentially arable highly weathered soils. These soils are located primarily in the tropics and subtropics, where intense chemical weathering occurs.

The outcome of the race between world food production and population will largely determined in the tropics, where most of the world's undernourished people live. There are three avenues for increasing food production in the tropics : increasing yields per unit area in presently cultivated regions, opening new lands to cultivation, and expanding irrigated land. The first two require the alleviation or elimination of soil constraints, while the third eliminates water stress as the main constraint limiting crop production. All the three alternatives are needed. According to FAO estimates, increasing yields on lands already in use is not sufficient, and additional land must be incorporated into agriculture to accomplish this goal. Making efficient use of acid soils is one of the most important option to achieve the goal.

Most well drained tropical soils, which are not currently used for agriculture, are acid. This is not generally true for soils presently under cultivation, because since man started to grow crops he has always tended to settle on high base status soils.

Acid soils are developed under high rainfall conditions and, because of their specific nature, pose several problems for successful crop production. The various aspects of management of acid soils have therefore, attracted the attention of several research workers during last fifty years.

In humid climates, weathering and leaching processes lead sooner

or later to natural acidification of permeable soils unless airborne salts are deposited or counteracting measures are taken by man. The, acid soil infertility is a major limitation to crop production on highly weathered and leached soils in both tropical and temperate regions of the world. In addition, soil acidification caused by leaching with acid precipitation (an outcome on industrial expansion) is a subject causing increasing concern. Apart from the above process, application of acid forming fertilizers, decomposing plant residues and organic wastes contribute quite a bit to acidity. Soils may also be acidic when derived from acidic parent material or materials initially low in the basic cations (Ca^{++}, Mg^{++}, K^{+} and Na^{+}).

The acid soils represent the largest land reserve available for meeting mankind's future needs for food, fibres and other plant products. Soil acidity is a major growth limiting factor for plants in many parts of the world.

Aluminium and other toxicities associated with it, low contents of major plant nutrients, trace element deficiencies and disease hazards have all hindered the intensification of agricultural production on these soils.

Acid soil injury is an insidious problem; it may be mistaken for an ordinary nutrient deficiency, drought effect, herbicide injury, low temperature damage, or even a plant disease. Subsoil acidity is particularly harmful as it results in shallow rooting, susceptibility to drought and inefficient utilisation of plant nutrients.

Low fertility and management problems associated with soil maintenance and improvement are the major obstacles to the efficient use of acid soils for crop production. Climate and topography are generally favourable and seldom limit crop yields.

Adequate knowledge of their properties and management requirements is crucial for their further development and preservation for use by future generations.

Contrary to common belief, the productivity of these soils can be improved and continuous crop production is possible, provided they are managed correctly. With adequate inputs and proper care, the

annual productivity of these soil can far exceed the productivity of most fertile soils.

Investment on good seeds, chemical fertilizers and improved agricultural practices would give little return on strongly acid soils unless they are adequately limed. Lime was used even before the birth of christ to improve the productivity of crop land. All through the ages, lime in some form has served similar purpose. Records kept by pilgrims mention the use of lime as early as 1661. The practice of liming acid soils to reduce phytotoxic levels of Al and Mn has long been recognised as necessary for optimal crop production in such soils.

During the last five decades significant advances have been made in the characterisation and management of acid soils for successful crop production. It is the aim of this monograph to review the experiences already acquired and to summarise the research findings, which have recently become available.

Efforts of soil scientists, agronomists, plant physiologists and agricultural engineers have been a foot to diagnose and rectify the limps and shrinks of acid soils all over the world. The accurate and precise adoption of reclamative and management measures is very important because the right and useful treatment accruing practical results depend on that.

Efforts have been made to provide the latest research findings in a concise form so that scientists and planners can help the farmers to make efficient use of acid soils. Only a thorough knowledge of sound crop production techniques can ensure optimal utilization of vast acid soil resources.

The text will be perceived by the astute readers as some what uneven in its treatments of various chapters. We feel that this is to certain extent appropriate, for it thus portrays the unevenness of progress to date in the corresponding areas of research.

L. L. Somani

About the Book

Acid soils are developed under high rainfall conditions and because of their specific nature, pose several problems for successful crop production. Acid, Al, Mn, Fe(II), H_2S, salt injury and other toxicities associated with it, low contents of plant nutrients, trace element deficiencies and disease hazards have all hindered the intensification of agricultural production on these soils. Subsoil acidity is particularly harmful as it results in shallow rooting, susceptibility to drought and inefficient utilisation of plant nutrients. Undrained soils with sulphides *i.e.* potential acid sulphate soils have the potential of developing high acidity when drained for cultivation.

According to FAO estimates, additional land must be incorporated into agriculture to meet the food and fibre needs of mankind. The largest reserves of potential arable land still available in the world are acid soils.

The book provies a comprehensive and critical diagnosis of various acid soils, limitations posed by them for successful crop production and suggests measures to overcome their limitation. The book provides in depth information on liming, reclamation and management of these acid soils for crop production.

It is the aim of this monograph to review the experiences already acquired and to summarise the research findings which have already become available.

About the Author

Prof. L.L. Somani (b 1945) holds a brilliant academic record. He started his carreer as Research Assistant and rose to the position of Director of Resident Instructions (MPUAT, Udaipur) from where he superannuated in October 2005. He has published several books and over 300 research/technical articles in reputed journals. He has been honoured by several awards for his outstanding contributions.

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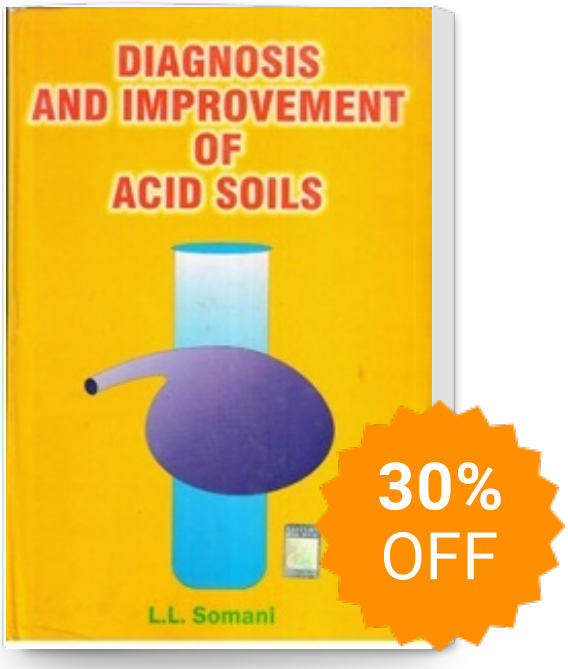

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