

Soil and Plant Analysis Laboratory Manual

Second Edition

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Foreword

Soils vary greatly throughout the world; they have inherent weakness, primarily deficiency in nutrients essential to growing crops. Even when adequately supplied in the early stages of land cultivation, the nutrient-supplying capacity invariably diminishes with time. Most soils are deficient in nitrogen; it is transient in nature and plants need a lot of it. In many cases, phosphorus (P) is just as critical; soil chemical reactions reduce the effectiveness of P fertilizers. The soils of the Central and West Asia and North Africa (CWANA) region are generally well supplied with potassium, and usually don't need fertilization, especially for low-yielding rainfed crops. In recent years, a realization has grown that other elements, e.g., micronutrients, are deficient in some areas of the CWANA region.

As no essential element will substitute for another, it is critically important to identify where and when such deficiencies occur. That's where the role of soil and plant analysis comes in. Techniques have been developed to evaluate soil fertility constraints based on soil chemical extraction and analysis of the plants that grow on such soils. Both are complimentary and, when calibrated with field crop response to fertilizer, provide a rational basis to identify what elements are missing, and how much fertilizer to apply. Therefore, soil and plant analysis laboratories have a vital role in agricultural development of the CWANA region. However, the process does not end there. To be meaningful and valid, tests have to be appropriate for the purpose intended and reliable and repeatable.

As ICARDA had spearheaded the Soil Test Calibration Program within the region's National Agricultural Research Systems (NARS), and laid the basis for sound fertilizer recommendations, it was only appropriate that ICARDA should, in collaboration with NARS, address this fundamental issue. This manual is a cornerstone in ICARDA's training program and a vital link with scientists of the CWANA region.



Prof. Dr. Adel El-Beltagy
Director General
ICARDA

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Preface

The idea of having a common laboratory manual for the Central and West Asia and North Africa (CWANA) region was based on the fact that the soils in this arid to semi-arid area have a common suite of properties, leading to similar nutritional problems in crops. Collaborative research in the Soil Test Calibration Network in the Mediterranean zone had also revealed that a number of soil tests for assessing nutrient availability have regional applicability. In addition, there was hardly any laboratory manual on plant analysis relevant to the crop nutritional problems in the region.

A common soil-plant analysis manual is also fundamental for success of the CWANA soil fertility network. To fill the gap that existed, a comprehensive manual on all sorts of needed soil and plant analyses was developed. This manual was designed intentionally in a "cook-book" format, for the ease of laboratory technicians. On completion, the manual draft was reviewed and endorsed by a sub-committee at the Soil Fertility Meeting in ICARDA (Nov.19 - 23, 1995).

Subsequently, first edition of the manual was published in 1996, and distributed quite widely among soil-plant analysis laboratories throughout the CWANA region. The response was very encouraging. Most laboratory managers appreciated the initiative, particularly for compiling of all the needed methodologies in a single volume in an easy-to-use format for laboratory technicians.

This second edition has incorporated all the feedback from laboratory managers of the CWANA region, making the manual more comprehensive, up-to-date, and hopefully error-free. We appreciate the constructive criticism and suggestions advanced by the fellow soil scientists for improvement of the manual.

The second edition of the manual reflects the changes that have occurred within the past few years in the region. While it is still focused on production agriculture, it reflects an increasing concern about environmental pollution, mainly from nitrate, heavy metals, and toxic organic compounds. With greater sophistication in methodologies and equipment, most soil laboratories can now deal with both agricultural and environmental concerns.

We again encourage all the users of this manual to continue to provide feedback regarding its utility for their particular situations, and indicate errors, if any.

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The contribution of Dr. Karl Harmsen and Miss Sonia Garabet to the authorship of the first edition of this manual is recognized.

The assistance of Mr. Samir Masri is much appreciated, particularly for his contribution regarding the soil sampling procedures presented in this manual.

The Soil-Plant Analysis Laboratory has, since ICARDA's inception, played a vital role in the research activities of the Natural Resource Management Program (NRMP) and indeed throughout the Center. The ICARDA management has always supported the Soil-Plant Laboratory; without this support, this manual of adapted soil and plant analysis procedures would not have been published.

Our thanks go to readers who have noted errors in the first edition of this manual and those who made suggestions for improvement.

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