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FIELD SOIL WATER REGIME

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FOREWORD

There is no doubt that water plays a significant role in determining the nature and properties of soils. It dissolves soil minerals and is the means whereby the products of dissolution are transported from one horizon to another. It governs the permeation of air into soil pores and, hence, chemical and biological oxidation and reduction. By reason of its relatively large heat capacity and heat of fusion, it has a profound influence on soil temperature. As it filters into or evaporates from the soil, the attendent swelling and shrinking affect soil structure. Its flow over and into the soil redistributes the soil particles. In its absence, life in the soil comes to a virtual standstill. Indeed, all the physical, chemical, and biological reactions and processes that occur in the soil are dependent on its presence.

Water in the soil is absorbed, utilized, and transpired by the plants growing on it. Further, as already noted, it affects the properties of the soil and the reactions and processes that occur therein. Plants are sensitive to these properties, reactions, and processes. Hence, soil water affects plant growth and development both directly and indirectly.

In view of the importance of soil-water interrelations and their quantitative description, a symposium was held in 1971 at the annual meetings of the Soil Science Society of America on the topic "Field Soil Water Regime." This volume includes the papers presented at that symposium. Although it is recognized that these papers do not include all aspects of the subject, it is hoped that they will facilitate understanding and illustrate the wide range of activities related thereto.

August 1973

PHILIP F. LOW, *president*
Soil Science Society of America

PREFACE

In recent years quantitative description of the field soil water regime has become increasingly common. There are perhaps three main reasons. One is that physical theory and the required laboratory verification now would seem adequate to describe the water regime of soils under field conditions. The second is that it is now possible by computer to make calculations easily that involve the interactions of several variables; previously such calculations were very laborious or impossible. And thirdly, there is the emphasis in recent years on activities designed to better understand the soil as a medium for the disposal of pollutants. This concern for environmental questions has increasingly led experimentalists to perform experiments outdoors. This same concern for environmental questions has led soil morphologists and others concerned with description of natural conditions to become more concerned with the numerical description of the soil water regime.

The time, therefore, seemed right to present a sample of the kinds of research within the Soil Science Society of America and the American Society of Agronomy on the description of the soil water regime. Speakers and subjects were selected to provide a broad spectrum of approaches and research results. An attempt was made to include both papers that would orient the reader generally in a subject area and papers that are highly specific to a particular research interest. Some of the papers are highly quantitative; others are largely descriptive of the natural condition. Taken together, the papers illustrate the wide range in activities designed to characterize the soil water regime. This was the intent in their selection.

This group of papers is not intended to provide a coherent review of the subject. Rather, it is hoped that they would provide windows from one field of specialization to another. In this way they may help to increase the coherence of the subject area for the future.

September 1972

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Conversion Factors for English and Metric Units and Plant Nutrients

To convert column 1 into column 2, multiply by	Column 1	Column 2	To convert column 2 into column 1, multiply by
	LENGTH		
0.621	kilometer, km	mile, mi	1.609
1.094	meter, m	yard, yd	0.914
0.394	centimeter, cm	inch, in	2.54
	AREA		
0.386	kilometer^2, km^2	mile^2, mi^2	2.590
247.1	kilometer^2, km^2	acre, acre	0.00405
2.471	hectare, ha	acre, acre	0.405
	VOLUME		
0.00973	meter^3, m^3	acre-inch	102.8
3.532	hectoliter, hl	cubic foot, ft^3	0.2832
2.838	hectoliter, hl	bushel, bu	0.352
0.0284	liter	bushel, bu	35.24
1.057	liter	quart (liquid), qt	0.946
	MASS		
1.102	ton(metric)	ton (English)	0.9072
2.205	quintal, q	hundredweight, cwt (short)	0.454
2.205	kilogram, kg	pound, lb	0.454
0.035	gram, g	ounce (avdp), oz	28.35
	PRESSURE		
14.50	bar	lb/inch^2, psi	0.06895
0.9869	bar	atmosphere,* atm	1.013
0.9678	kg (weight)/cm^2	atmosphere,* atm	1.033
14.22	kg (weight)/cm^2	lb/inch^2, psi	0.07031
14.70	atmosphere,* atm	lb/inch^2, psi	0.06805
	YIELD OR RATE		
0.446	ton(metric)/hectare	ton (English)/acre	2.240
0.891	kg/ha	lb/acre	1.12
0.891	quintal/hectare	hundredweight/acre	1.12
1.15	hectoliter/ha, hl/ha	bu/acre	0.87
	TEMPERATURE		
$\left(\frac{9}{5}\,°C\right) + 32$	Celsius	Fahrenheit	$\frac{5}{9}(°F - 32)$
	-17.8 C	0 F	
	0 C	32 F	
	20 C	68 F	
	100 C	212 F	

PLANT NUTRITION CONVERSION--P AND K

P (phosphorus) × 2.29 = P_2O_5
K (potassium) × 1.20 = K_2O

* The size of an "atmosphere" may be specified in either metric or English units.