Chapter 1

Introductory Chapter: Soil Moisture

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1. Introduction

Water is the common medium for several life processes. There is no lifecycle without water. Moreover, in plants situation, the uptake of nutrients through the roots is intermediated by soil water. Consequently, water and soil are the elementary requirements for the life and growth of plants. Nevertheless, water availability in soils is restricted, and therefore, its administration and measurement turn into an indispensable issue [1]. Water management includes understanding about the release pattern and storage of water by the soil. This knowledge on storage and release also needs understanding about physical biological and chemical properties and soil processes [2]. Soil properties strongly affect processes, which take place on it: among others, soil remains warm or cool, dry or wet, aerobic or anaerobic, friable or rigid, highly porous or compact, aggregated or dispersed, impermeable or permeable, eroded or preserved, saline or unsalted, nutrient-rich or percolated, etc. The last regulates whether the soil water content can be a good or bad medium for various varieties of plants as well as for different methods of production and whether it can conveniently help as an operative convertor for environmental contaminants, rather than as a transmitter of them. The soil moisture content correspondingly referred to as water content and is an indicator of the quantity of water existing in soil. By means, moisture content in soils is the relation of water quantity in a portion to the quantity of solids in the soil sample, expressed as a proportion for example (percentage) [3].

Related to other constituents of the hydrological cycle, the dimension of soil moisture is slight; nevertheless, it is of essential significance to numerous biological, hydrological, and biogeochemical processes. Soil moisture data are appreciated to an extensive variety of administration agencies and private corporations concerned through meteorological conditions and climate, inundation control and runoff potential, soil erosion, water reservoir controlling, and water quality, among other subjects. Soil moisture is a crucial variable in governing the

exchange of water and warmth energy among the land surface and the atmosphere through plant transpiration and soil evaporation [3, 4]. As a consequence, soil moisture shows a vital protagonist in the development of climate patterns and the creation of precipitation. Climate prediction models have shown that enhanced description of superficial soil moisture and plants can lead to noteworthy estimation enhancements. Likewise, soil moisture intensely disturbs the volume of precipitation that runs off inside proximate rivers and streams. Worldwide, significant landscapes with dry or wet shallow areas have been observed to report positive response on succeeding rainfall patterns. Also, soil moisture data can be used for water reservoir content and managing, early advice of deficiencies, irrigation planning, and crop yield estimation [1, 5].

Even though the importance of soil moisture data availability, widespread and constant quantifications of soil moisture is negligible. As mentioned before, there is still a deficiency of conclusive methods of soil moisture measurement worldwide [2, 4]. Undoubtedly, a necessity subsists for constant measurements of shallow soil moisture through a worldwide reportage. These book chapters aim to understand soil moisture behavior, including classical and new tools, which cover a wide range of moisture indices. Classical techniques of water content analysis showed in this book included soil moisture measurements obtained by drying a known quantity of soil sample in an oven and pore spaces percentage of the soil volume not occupied by solids and assumedly occupied by air and water [4]. Among new water content estimation tools, this book included remote sensing and TDR technique approximations, which use the energy emitted from the soil layers [2]. Finally, this book was designed to meet the needs of researchers, students, and academics and pursued the subsequent objectives: (a) assess the influence of soil practices on soil moisture release and retention properties, (b) relate the water indices with the soil moisture properties and characteristics, (c) estimate soil moisture release and retention among different soil types, and (d) evaluate and develop suitable models to estimate soil moisture content at different scales and levels of analysis. In order to meet these objectives, scientists and academics from different continents have been involved in the field and laboratory experiments to address some answers, which dare to face with emerging technology in soil moisture assessment.

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