

Soil Basics, Management and Rhizosphere Engineering for Sustainable Agriculture. Channarayappa and D. P. Biradar. CRC Press, Taylor & Francis Group, 6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL 33487-2742, USA. 2019. 829 pages. Price: £180.

The book under review highlights the importance of soil, its impact on management and rhizosphere engineering for sustaining agricultural productivity in the future. The importance of healthy soil for sustainable farming without compromising the ecological balance on earth is presented by the authors. The importance of soil health maintenance and achieving sustainability is gaining national and international attention due to abuse of important natural resources such as soil, water and air. This book is well designed with six broad areas explaining the approach for sustainable agriculture which include soil basics, soil management, plant nutrients and biological protection, soil organisms, soil–water–plant relationships and rhizosphere engineering. In the recent past, it has been observed that drastic global agricultural transformations have taken place in the farming systems due to modern cultivation practices and nutrient management. The government agencies have also introduced programmes for the development and dissemination of improved agricultural practices.

The authors have made an effort to explain the history and basic concepts of soil-based sustainable agricultural practices which have been diversified due to growing population, economic instability, climate change and striving for high production. The crop production potential was mainly emphasized on use of agrochemicals and conventional agricultural practices. However, for maintaining

a balanced ecosystem, inclusion of organic resources in the long run is of paramount importance. Improved technologies such as irrigation, intercropping, crop rotation and agriculture of the 21st century have progressively increased the productivity in agriculture. Intercropping is one of the most accepted practices which is still being implemented to promote biodiversity, soil composition and sustaining soil and plant health.

The book provides information on the basis that the earth comprises of the most natural living resource, viz. ‘soil’ which is an active portion of the earth’s crust wherein the bio-geochemical processes take place for sustainable agriculture. Soil is the primary nutrient source for plants, microflora and fauna. The soil-forming process due to weathering of rocks and minerals, etc. has been well explained with the help of graphs, diagrams and various biological cycles using lucid language. Further, the soils are classified according to their morphological, chemical and physical properties. It is needless to mention that sustainable agriculture plays a major role in conserving energy and water with emphasis on local production, making efforts to decrease inputs and judiciously using natural resources considering biodiversity and ecology.

The book also mentions the methods and practices of sustainable agriculture, suggesting their benefits and importance. Facts have also been elaborated to emphasize that millions of tonnes of crop residues produced annually contribute towards maintaining soil fertility. The concern about soil degradation has been raised to encourage people to conserve soil and water, thereby further maintaining soil health for sustainable agriculture. It is difficult to explain and signify the importance of soil water potential for agricultural scientists and agricultural engineers to describe its importance in nutrient-based sap flow through the roots into the plant system. However, the authors explain well the role of water in agriculture, particularly in nutrient management to ensure proper balance between soil, water and air. Organic soils have the capacity to retain more water which naturally helps in increasing the biomass production leading to higher yields.

Further, efforts have also been made to describe the soil management-related

operations, practices and treatments used to protect the soil environment and enhance its performance, such as soil fertility or soil mechanics which includes soil conservation, soil amendments and optimal soil health. Soil organic matter being proved as a vital aspect of soil management helps in improving physical, chemical and biological properties of the soil, which are also defined as the soil quality indicators in sustainable agriculture. The authors discuss agricultural technologies for sustainable agriculture by way of organic farming, or more precisely through addition of organic matter, crop residues, compost, etc. They have further emphasized that organic agriculture should be economically, environmentally and socially sustainable, and most probably based on integrated methods. Precision agriculture and nano technology are also mentioned with respect to organic farming.

The book also emphasized the goals of production, where plant nutrition plays a vital role. Studies on plant nutrition mechanisms are essential for plant growth, plant metabolism and their availability. Maintaining soil fertility and plant nutrition supply through the nutrition management system is noteworthy for desired productivity through organic, inorganic and biological components in an integrated manner. The plant nutrition management involves scientific methods encompassing soil, crop, weather and hydrological factors along with cultural, irrigation, and soil and water conservation practices. The integrated approach has been well defined to achieve the aims of administering nutrient use efficiency, crop yields, crop quality and economic returns. The use of 4Rs, i.e. application of nutrients at the right rate, right source, right time and right place has been given due attention in the book to understand the importance of nutrient management.

Soil biota, broadly termed as the living microorganisms, flora and fauna in the soil rhizosphere utilizing water, air and organic carbon and helping the soil to be living entity has also been taken care by the authors to describe in cyclic form with appropriate diagrams in simple manner. The two crucial characteristics of a healthy soil are the rich diversity of biota and high content of non-living soil organic matter. The organisms living in the soil play an important role in maintaining the health of soil and plants. It is well known that plant growth depends on

the rich resources of soil minerals and soil water plays an important role in plant metabolism.

The plant physiologists, agronomists and soil scientists need to understand the plant structure, its function, growth and development for knowing the plant and soil relationship. Further, special attention has been given to understand the balance nutrition, transport and leaching losses through soil. The nutrient uptake by plants is supposed to be one of the most important physiological processes which helps in plant growth and development owing to the combination and concentration of mineral nutrients available in the soil solution. Nutrient uptake is the process successfully implemented by young roots, especially by the root hairs. The absorption of water through roots is always in a continual state of flux and further, the uptake of water by the cells generates a pressure known as turgor, as has been stated in the book.

The authors deserve appreciation for stating the importance of abiotic stress in the book which mainly focuses on soil basics and management. Different abiotic stress factors like cold, drought, salt and heavy metals largely influence plant development and crop productivity. It has become a major threat for food and nutrition security due to the impact of climate change and deterioration of the pedo environment and atmosphere caused by anthropogenic activity. The water and salt stress related to soil has a direct influence on plant growth and development. In order to overcome the abiotic stress, plants initiate a number of molecular, cellular and physiological changes as mentioned in the book.

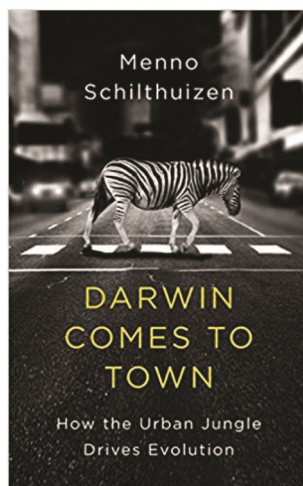
The major thrust of the book is on rhizosphere engineering for achieving sustainable agriculture. Rhizosphere is the most important zone of the soil around the roots being influenced by root activity through the release of organic materials. The rhizosphere engineering permits improvement of plant and soil health. The rhizosphere can be manipulated artificially to improve plant health and productivity. The modification of soil parameters, as well as microbial or plant engineering are strategies developed to engineer the rhizosphere. Thus rhizosphere engineering may ultimately reduce our reliance on agrochemicals by replacing their functions. This is of great significance for formulating future soil research.

This book should be in every library and will prove useful to soil scientists, agronomists, environmental scientists, biochemists and those involved in natural resource management. It can also be of immense importance to teachers, students, farmers and all those who are involved in agriculture and allied subjects. The basic concepts and mechanisms are explained with neat and self-explanatory figures, cycles, diagrams and appropriate photographs.

I appreciate the efforts of the authors and publishers for bringing out this valuable book which will have significance for designing and formulating educational, research and extension activities in soil science, agronomy, plant physiology, environmental science and other related subjects in the coming years.

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Darwin Comes to Town: How the Urban Jungle Drives Evolution. Menno Schilthuis. Quercus Editions Ltd, Great Britain. 2018. 344 pages. 1571 (Hardcover). ISBN 978-1-78648-110-8.

Planet earth is increasingly becoming an urbanized landscape occupying about 3% of the earth's land surface with over half of the human population inhabiting the cities. Cities around the globe are the same. They all produce similar kinds of

trash, have roads and high-rise buildings with higher temperatures (heat islands), are sources of light, air and noise pollution, increase habitat fragmentation, decrease native species diversity, etc.

Life forms on earth are now forced to live and adapt to these city conditions. It is important to understand that ecological processes operate within cities, and urban ecosystems are extremely different from their more natural counterparts. Nevertheless, most of the insights in ecology and evolutionary biology to date come from the natural forested landscape or undisturbed locales. Despite advances in tools answering questions in evolutionary biology, the scientific fraternity seems to have scanty understanding of urbanization affecting the evolution of life forms that inhabit the cities.

This book aptly addresses the aforementioned concerns in an elegant manner with close-to-home examples.

Present-day cities are often considered as adversaries of nature, unfruitful, sterile and post-industrial dump yards. However, the author is successful to a vast extent in driving the readers to change this notion of cities, with the following arguments:

- (a) The importance of evolutionary adaptations occurring at a rapid phase and how plants and animals within cities are coming up with novel ways of adapting to the human crafted environments.
- (b) How adaptation and evolution happening within a city are resulting in the myriad ways of biodiversity within these urbanized ecosystems.

The book has 20 well-connected chapters beginning with the author's haunting childhood beginnings as a naturalist working on beetles and ants. Then it succinctly explains the mechanisms of evolution such as gene flow (the bobcat making a comeback around suburbs and cities in California, USA), genetic drift (white-footed mouse at New York City, London underground Mosquito in the Subway metro stations), mutation (sensitivity of the mummichog fishes to PCB and PAH pollution, melanistic feathers of pigeons), natural selection (peppered moth adaptations, *Anolis* lizards at Puerto Rico) and sexual selection (song adaptation of the great tits to noisy surroundings, Australian jewel male beetles trying to mate with stubby beer bottles,