

CONTENT

| | Page |
|---|------|
| Preface | v |
| 1. Introduction | 1 |
| What is soil physics? | 1 |
| The place of soil physics in soil science | 1 |
| The purpose of the study of soil physics | 2 |
| Historic background of soil physics | 2 |
| Soil-physics literature | 4 |
| 2. Soil Water | 6 |
| Properties of water | 6 |
| Hydrology | 24 |
| The energy of soil-moisture retention | 39 |
| Soil-moisture constants and classification of soil moisture | 49 |
| Movement of soil water | 55 |
| Effect of soil moisture on plant growth | 65 |
| Effect of soil moisture on soil conditions and soil development | 69 |
| Methods of measuring and expressing soil moisture | 73 |
| Soil-water management | 77 |
| References | 79 |
| 3. Mechanical Composition of the Soil | 81 |
| Classification of soil particles | 81 |
| Specific surface of soil particles | 85 |
| Soil textures | 88 |
| Mechanical analyses | 92 |
| References | 99 |
| 4. Soil Clays | 100 |
| The nature of clay | 100 |
| Properties of the layered aluminosilicate clays | 101 |
| The main groups of clay crystals | 106 |
| Classification of clays | 108 |
| Clays that are not layered aluminosilicates | 110 |
| The origin and occurrence of clays | 110 |
| The significance of clays in soils | 111 |
| Methods of identifying and studying clay | 112 |
| References | 117 |
| 5. Soil Structure | 118 |
| Architecture of soil and the meaning of soil consistence and soil structure | 118 |
| Soil consistence | 119 |
| Soil structure | 124 |
| Definition and importance of structure | 124 |
| Classification of soil structure | 124 |
| Genesis of compound soil structure | 126 |
| Factors inducing dispersion | 134 |
| The effect of texture on structure | 134 |
| The structure profile | 135 |
| Desirable soil structure | 135 |
| Measuring soil structure | 137 |
| Managing soil structure | 141 |

| | | |
|-----|---|-----|
| | References | 141 |
| 6. | Organic Matter | 143 |
| | Definition and classification of soil organic matter | 143 |
| | Origin and formation of humus | 144 |
| | Composition and properties of humus | 145 |
| | Classification of humus | 146 |
| | Decomposition of organic matter | 147 |
| | Occurrence of humus | 149 |
| | Functions of organic matter in the soil | 151 |
| | Organic matter as a parameter in soil classification | 153 |
| | Methods of studying soil organic matter | 154 |
| | Management of soil organic matter | 156 |
| | References | 158 |
| 7. | Soil Air | 160 |
| | Functions of the individual components of soil air | 160 |
| | Plant requirements for soil air | 160 |
| | Composition of soil air | 162 |
| | Air capacity of the soil | 162 |
| | Renewal of soil air | 163 |
| | Soil aeration and other soil properties | 165 |
| | Measuring soil aeration | 166 |
| | Soil-air management | 168 |
| | References | 170 |
| 8. | Soil Temperature | 171 |
| | Our interest in soil temperature | 171 |
| | Thermal concepts and units | 172 |
| | Factors affecting soil temperature | 174 |
| | Soil-temperature fluctuations | 181 |
| | Effect of soil temperature on other soil conditions | 184 |
| | Effect of soil temperature on plant growth | 187 |
| | Soil-temperature management | 189 |
| | Measuring soil temperature | 190 |
| | References | 191 |
| 9. | Soil Color | 192 |
| | Colors that occur in soils | 192 |
| | Causes for soil colors | 192 |
| | Significance of soil color | 193 |
| | Effect of colors on other soil conditions | 194 |
| | Study and classification of soil colors | 195 |
| | Management of soil color | 198 |
| | References | 198 |
| 10. | Soil Physics as a Factor in Soil Management | 200 |
| | Purposes of managing the physical conditions of soils | 200 |
| | Crop requirements for soil physical conditions | 201 |
| | Adjustment of land use of the physical conditions of the soil | 202 |
| | The aims of managing the physical conditions of soil | 204 |
| | Recognizing soil physical conditions | 206 |
| | Methods of altering soil physical conditions | 206 |
| | References | 218 |
| | Index | 219 |