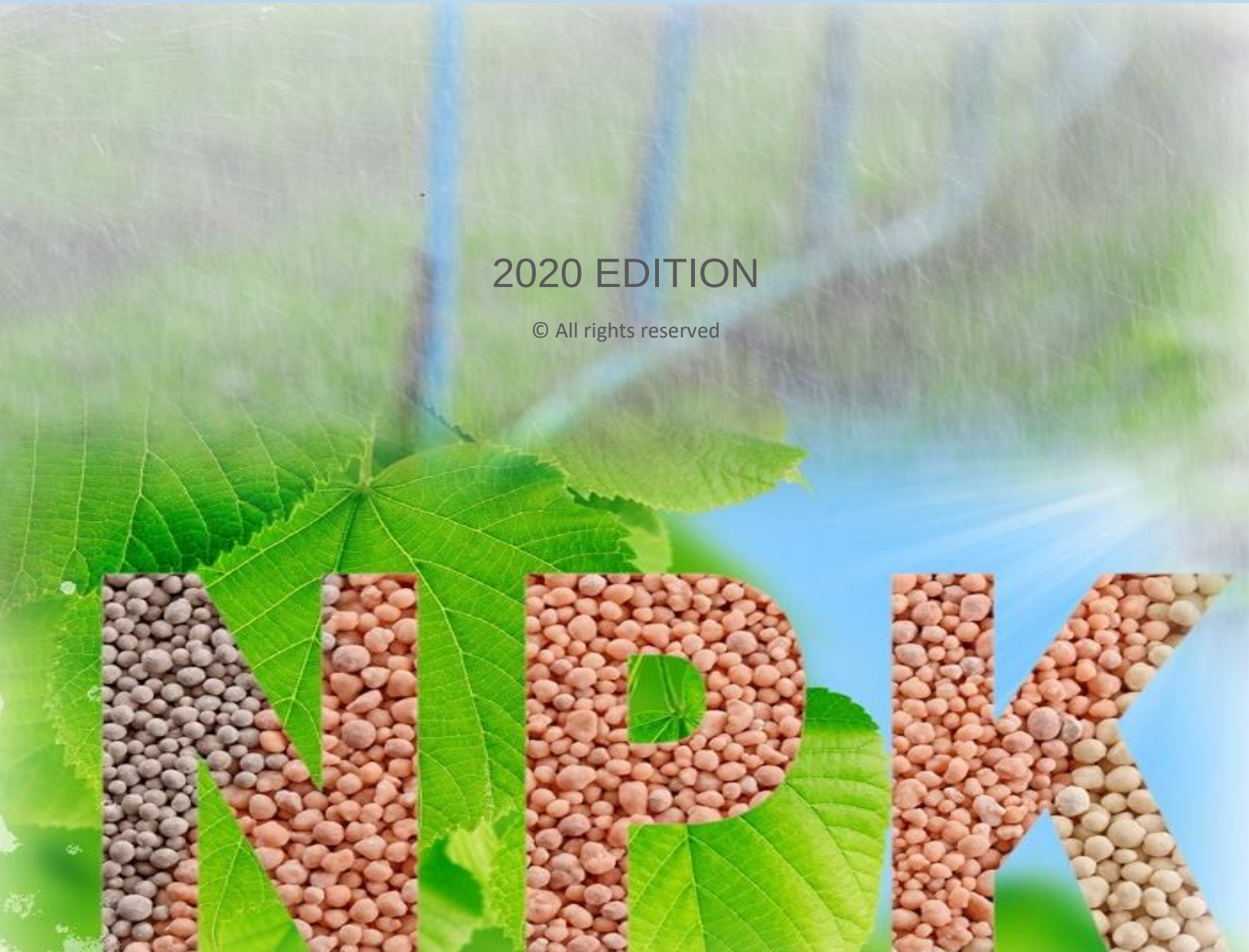
GUY SELA

FERTILIZATION AND IRRIGATION

THEORY AND BEST PRACTICES



2020 EDITION

About the Author

Guy Sela was born in 1973, in Rehovot, one of the first agricultural towns in Israel. Mr. Sela graduated, with a BSc. degree from the Hebrew University as an agronomical engineer with specialization and expertise in irrigation, fertilization and water treatment.

His work in large scales, nationally and internationally, enabled him to lead comprehensive research programs on crop nutrition and irrigation using cutting edge agricultural technologies.

His specialization in plant nutrition is the combination of the vast knowledge in water treatment and agriculture.

Guy Sela observed many growers who mainly rely on trial and error and estimation and past experience. The broad misuse of fertilizers and pesticides is a global phenomenon which results in decreased yields, waste, and damage to crops and the environment. This led him to establish his innovative venture Smart Fertilizer in 2008, Cropaia in 2018 and yieldsApp in 2019, all are start-up companies that are dedicated to innovation in agriculture.

Guy Sela is an internationally renowned speaker in in conferences, symposiums and online webinars, which are brought to thousands of growers, has allowed him to share his knowledge, expertise world-wide.

Table of Contents

Chapter 1 5

Plant Nutrition 5

Plant Nutrients - Introduction 6

Nitrogen 9

Potassium 13

Phosphorus 17

Calcium 21

Magnesium 23

Sulfur 26

Iron 29

Manganese 33

Zinc 36

Copper 39

Boron 41

Chloride - an Essential Nutrient or Harmful Element? 43

The Electrical Conductivity 46

The pH 50

Mineral Nutrition and Plant Diseases 51

Ammonium/Nitrate Ratio 54

Chapter 2 56

Water Quality 56

Irrigation Water Quality 57

Water Alkalinity and Buffering Capacity 62

Hardness 64

Effect of Water Salinity on Soil 66

Managing Irrigation Water Quality Problems 68

Testing Your Irrigation Water 70

Water Disinfection with Chlorine 73

Chlorine Chemicals for Water Disinfection 76

Chapter 3 80

Soils 80

Soil Fertility 81

Soil Water Content 84

Soil acidity 86

Soil Salinity 89

How to Prevent and Manage Soil Salinity 91
Cation Exchange Capacity of Soils 94
Understanding ppm in soil 97
The Soil Analysis 99
How to Interpret Soil Test Results 103
Soil Testing – The Extraction Methods 106
Soil Test Interpretation Guide 109
Cation-Anion Balance in Water and Soil 111
Sodic soils and Their Management 115
How to Raise Soil pH 118
How to Choose a Liming Material 120
Chapter 4 123
Fertilizer Management 123
Approaches For Giving Fertilizer Recommendations 124
Optimizing Fertilizer Application Rates 126
Timing and Frequency of Fertilizer Application 129
Pre-plant fertilizer application 132
Nitrogen Management 134
Compost: Benefits and Quality Parameters 137
Chelated Fertilizers and Their Use 140
Visual Identification of Nutrient Deficiencies 142
Understanding Plant Tissue Analysis 145
Foliar Feeding 148
Chapter 5 151
Fertigation and Hydroponics 151
Fertigation 152
Fertigation Best Practices 156
Hydroponic Systems 159
Hydroponic Nutrient Solutions 161
Balancing Nutrient Solutions 164
Challenges in Growing in a Closed Hydroponic System 166
How to Calculate Nutrient Solution Formulas 168
Preparation of Fertilizer Stock Solutions 172
Fertilizer Solubility 176
Fertilizer Injectors 179
How to Calibrate & Test Your Fertilizer Injectors 181
pH Adjustment in Fertigation and Hydroponics 184

How to Successfully Choose Growing Media..... 191
Physical Properties of Growing Media 194
Fertility Management in Container Plants 198
Plug plants – Testing and Monitoring Nutritional Status 201
Chapter 6 205
Irrigation 205
Water Requirements of Crops 206
Irrigation Scheduling Using Tensiometers 210
Irrigation Scheduling Using Evapotranspiration and Soil Moisture Evaluation. 213
Drip Irrigation Systems 217
How to Prevent Clogging in Drip Systems 221
Irrigation Management in Soilless Culture..... 224
Irrigation with Desalinated Water 228
Appendix I: Conversion Tables 230