Tropical and Subtropical Agroecosystems

FOREWORD

BELOW-GROUND BIODIVERSITY

Rising population in Kenya requires clearing of indigenous vegetation for settlement and farming or agricultural intensification to ensure food security. The consequences include loss of soil biodiversity and associated ecosystem services hence land degradation. With increasing global concern about the impact of man's activity on the environment, steps have been taken to counteract and these have been enshrined in international conventions to combat desertification, climate change and the loss of biological diversity. Kenya is a signatory to a number of International Conventions on Biological Diversity (CBD) which is a reflection of the country's commitment to the conservation and sustainable management of above and below ground biodiversity. This further shows the recognition of the ecosystem benefits from soil organisms such as bacteria, fungi and fauna which include nutrient cycling, hydrologic cycles regulation of greenhouse gas emission and soil carbon dynamics. This special issue presents results of a five year GEF/ UNEP project on Sustainable Management of Below-ground Biodiversity which was implemented in two benchmark sites in Kenya. It presents the status of soil biological diversity in Kenya.

Soil organisms are the primary agents of nutrient cycling hence food and fibre production. The soil fauna play a major role in modification of the soil structure which in turn regulates soil water dynamics. Soil microorganisms are a source of important medicines, including most of the early antibiotics such as penicillin. But despite their functional importance the soil biota remains a 'black box' to scientific understanding as well as to the common gaze due to a number of challenges which include, lack of appropriate methods to study these myriad of organisms and their complex ecosystem. The role they play in determining some crucial ecological functions has resulted in a shift in the way scientist view them and there is a major attempt to amass knowledge them so as to exploit them for development of sustainable utilization and management of soil resource.

This special issue presents results of diversity and abundance of selected groups of soil organisms and their interactions with soil bio-physical characteristics. To achieve these results a 5 year collaborative research was implemented by a multidisciplinary team of scientist from Kenya: The University of Nairobi, The National Museums of Kenya, Kenya Agricultural Research Institute, Kenya Forestry Research Institute, United States International University and Ministry of Environment and Natural Resource - Department of Resource Surveys and Remote Sensing. These institutions were backstopped by staff of the Tropical Soils Biology and Fertility Program of CIAT which was coordinating the activities in the seven countries where this project was being implemented. This book present not only the distribution, abundance and diversity of the different soil organisms but it also gives in detail the functional roles played by the soil biota bringing out the interactions between biodiversity and land use /types/intensification resulting from the diverse agro-practices and the aboveground biodiversity observed in the two benchmark sites. The first paper describes the benchmark sites including the soils and the effects of land use intensification on their quality, this is followed by six papers that give in-depth details on the dynamics of major soil fungi and their interactions with land use intensification. Presence of soil meso- and macro fauna and their relationships with aboveground diversity and human activity is given in the next three papers. Loss of below and aboveground biodiversity can only be arrested through establishment of appropriate policies that give clear guidelines on sustainable management of biodiversity. To this end the team conducted a desktop study review and document existing policies on biodiversity and the findings are presented in the last manuscript. The team was able to affirm the hypothesis that land use intensification would result in loss of biodiversity in each of the studied functional group and a relation with decline in soil health was established. It is the hope of those that had an intimate relationship with the life in soil for a period of five years that, the knowledge gained will be applied to develop appropriate and sustainable innovations for utilization of soil biological resources for the benefit of the environment and the humankind.

Prof. Richard K. Mibey, FWIF, EBS
Professor of Mycology
Vice Chancellor, Moi University,
Chairman, National Steering Committee,
Belowground Biodiversity Project, Kenya