Improving Soil Fertility Recommendations in Africa using the Decision Support System for Agrotechnology Transfer (DSSAT)

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Editors

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Preface

In sub-Saharan Africa (SSA), increasing agricultural productivity is critical to meeting the food security and economic development objectives in the face of rapid population growth. Presently, the agricultural sector supports over 80% of the people in SSA, which is also the major contributor of GDP. A key challenge for scientists, governments and other stakeholders in the region is that food production should increase by 70% by the year 2050 to meet the caloric nutritional requirements of the growing population. Agricultural intensification is expected to be the main avenue for achieving these food increases. Crop models offer the benefit of increasing our understanding of crop responses to management in different soil and climatic conditions. Such responses are often of a complex and non-linear nature given the innumerable interactions among weather, soil, crop, and management factors throughout the growing season. Crop models can also provide insights in what might happen to productivity under various climate change scenarios, a domain beyond the reach of field experimentation. The outputs can inform key decision-makers at local, national, and regional levels in order to put the appropriate measures in place. Although major advances in modelling have been made in the USA, Europe and Asia, sub-Sahara Africa (SSA) lags behind due to the limited number of soil scientists and agronomists with the skills to set-up and run crop model simulations. Having a well-trained cadre of African modellers would greatly facilitate the design of best crop management and adaptation measures in the varied environments and to boost agricultural productivity in the region.

Over the past 20 years, efforts have been put in place to train scientists in the use of crop models, but the human resource base remains meagre. Most of the training was in the form of workshops and due to post-workshop financial constraints, limited or no follow-up efforts were made. Moreover, the disciplinary nature of university training in the region is not conducive to integrated, interdisciplinary, systems approaches. It is against this backdrop that the African Network for Soil Biology and Fertility (AfNet) and their collaborators, realizing that sustained follow-up was the key roadblock, organized a training programme which culminated in this publication. Many more such programmes are needed in order to

strengthen the African modelling community in communicating effectively with decision makers as well as global community of modellers.

The chapters in this book present the context, key experiences and the results on the use of DSSAT in crop simulation. Chapter 1 presents the key steps and provides insights into building capacity for modeling in SSA. The experiences should inform capacity building efforts in order to choose carefully the training pathway. Chapter 2 summarizes the minimum data set required to set up and run crop models for (a) model applications, (b) general model evaluation and (c) detailed model calibration and evaluation. The chapter shows that little additional data could be all that one needs to have experimental data useful for modeling purposes. Chapter 3 discusses African soils and the key limitations to productivity. Chapter 4 focuses on sensitivities of DSSAT to uncertainties in input parameters while Chaps. 5–10 present key results of modelling from specific programs conducted in Ghana, Niger, Senegal and Kenya. The chapters present the key steps followed in the model calibrations and simulations for different themes including responses to fertilizer, organic resources and water management. Although the use of crop models is important in understanding African agriculture, there are key market and policy issues that must be addressed if agriculture is to be really improved. Thus Chap. 11 focuses on these issues and presents an integrated soil fertility management-innovative financing concept.

It is my hope that the approach to training, the model calibration and assessment procedures, the knowledge and wealth of experiences presented in this book will enhance the understanding and catalyse the use of crop growth models among the scientific community in Africa.

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