

Using Simulation Tools to Model Renewable Resources

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The Case of the Thai Rubber Industry

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To my mother, Armui Chanchaichujit, and in memory of my dear father, Anuwat Chanchaichujit, who told me to believe in the power of my dreams and never surrender. Thank you to my wonderful parents. Their faith in me and my capabilities motivates me all the time.

Janya Chanchaichujit

To Paulina and Manuel, my trusted and much loved partners in this wonderful adventure called life...

José F. Saavedra-Rosas

Preface

This book is about the application of simulation tools for the modelling of renewable resources in the Thai rubber industry. It aims to provide a hands-on approach to supply chain modelling by exploring the process and decisions in building a model. The emphasis is on the Thai rubber industry, modelled with the use of an open source software tool, Ptolemy II.

The contributions of this book are twofold with regard to modelling levels: how to model discrete event simulation (DES) using Ptolemy II, and how Thai rubber production, at an industrial level, may benefit from using this model for decision support systems. In addition, the simulation model developed in the book is made accessible to the non-technical reader—the manager, the entrepreneur or the policymaker in the Thai rubber industry—who can replicate it by following the instructions provided and by making use of open source software tools. The benefit of using open source tools is that the reader is not required to make a large investment (apart from their own time) in order to implement and use the models developed in the book. Techniques similar to those described in the book may be used not only for rubber-related problems, but also for any general application in renewable resources management,

including the palm oil industry, forestry, farming and livestock management.

This book consists of six chapters. Chapter 1 presents the background related to the book: the natural rubber industry, decision support systems for the rubber industry and a simulation model. In Chap. 2, the elements of the natural rubber industry supply chain are presented. This chapter aims to introduce the reader to the physical transformation of rubber and categories of natural rubber products. The common definitions for each rubber supply chain entity and their relevant processes are presented, along with logistics and marketing activities and decision making. In addition, supply and demand mechanisms are discussed in order to understand how price is formulated in the natural rubber industry. Chapter 3 is concerned with the discrete event simulation (DES) paradigm. The main objective of this chapter is to provide the reader some basic philosophical foundations of the technique, and it also serves as a brief introduction to Ptolemy II, as it illustrates some of the concepts presented by using the software in the context of a simple example. Chapter 4 presents a discrete event simulation (DES) model, which is built step by step using Ptolemy II, and the elements of the model are explained. After the design decisions have been made, the elements are implemented and integrated into the model being built. In each step of the process, checks and control measures are put in place in order to guarantee the validity of the model in a way that resembles unit testing in programming. In Chap. 5, the building blocks developed in Chap. 4 are used to model the Southern Thailand rubber supply chain. After the model is built, it is validated to check the consistency of the observed movement and the material movement at the regional level. The chapter concludes by analysing the capability of the model using case studies. Chapter 6 concludes the book, with summaries and recommendations for future research.

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Finally, the authors wish to express special thanks to their families, who supported them wholeheartedly during the preparation and writing of this book.

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