

TABLE OF CONTENTS

1	GENERAL INTRODUCTION	1
1.1	Surface runoff, infiltration process and rainfall partitioning in the tropics	1
1.2	Research goals and objectives	3
1.3	Justification of the study.....	4
2	STATE OF KNOWLEDGE.....	5
2.1	Runoff generation phenomena.....	5
2.2	Field studies	6
2.3	Study by models	8
2.4	Geomorphometric analysis and digital terrain modeling.....	13
2.5	Infiltration process	13
2.6	Scale issues in runoff and infiltration processes	16
3	MATERIALS AND METHODS	20
3.1	Study area description: location, geography and topography.....	20
3.2	Site instrumentation.....	23
3.3	Design of runoff plots, construction materials and process.....	24
3.4	Hydraulic conductivity and infiltration measurement	26
4	MODEL DEVELOPMENT.....	28
4.1	Background	28
4.2	Model outline.....	28
4.3	Bed and friction slopes	30
4.4	Net lateral inflow.....	34
4.4.1	Rainfall and vegetation.....	35
4.4.2	Infiltration.....	36
4.5	Numerical methods for solution of surface runoff equation.....	38
4.6	Selection of method	39
4.7	Leapfrog scheme.....	44
4.8	Adaptation of Leapfrog scheme.....	46
4.9	Computational process.....	48
4.10	Initial and boundary conditions	53
4.11	Computational time optimization.....	55
4.12	Time filtering.....	55
4.13	End of simulation.....	57
4.14	Numerical test for the developed solution.....	58
5	FIELD RESULTS AND DISCUSSION	61
5.1	Rainfall and runoff distribution.....	61
5.2	Unit runoff discharge	69
5.2	Runoff coefficient.....	73
5.3	Hydraulic characteristics of runoff plots	81
5.4	Soil moisture dynamics.....	90
5.5	Scale dependence of runoff response	93

6	MODEL RESULTS AND DISCUSSION.....	99
6.1	Model implementation.....	99
6.2	Model evaluation and testing.....	100
6.3	Simulation experiments	108
6.4	Scale effect.....	109
6.5	Spatial variability of soil hydraulic properties and surface runoff process	114
6.6	Effect of microtopography on surface runoff process	120
7	CONCLUSIONS AND RECOMMENDATIONS	129
8	REFERENCES	133