CONTENTS

An Estimation of the Value of Water in the Commercial Forestry Sector in Selected Areas in South Africa: A Case Study of KwaZulu-Natal

EXECUTIVE SUMMARY

ACKNOWLEDGEMENT

CONTENTS

LISTS OF TABLES

LIST OF FIGURES

PAGE

CHAPTER 1

INTRODUCTION

1.1	Problem Setting
	1.1.1 The Water Scarcity Problem
	1.1.2 The Changing Water Paradigm
1.2	Water Use in Commercial Forestry in South Africa
1.3	Need for the Study
1.4	Objectives of the Study
1.5	Scope of the Study and Estimation Method
1.6	Outline of the Report

CHAPTER 2

WATER AVAILABILITY, USES, AND WATER USE REGULATION IN COMMERCIAL FORESTRY

2.1	Water	Availability or Supply	9
2.2	Types	of Water Use/Demand	11
	2.2.1	Agricultural Water Use	13
	2.2.2	Domestic or Urban Water Use	14
	2.2.3	Environmental Water Use	14

	2.2.4	Industrial Water Use	. 15
	2.2.5	Forestry Water Use	. 15
2.3	Water	Use in Commercial Forestry	. 15
	2.3.1	Early Concerns about Water Use by Alien Species.	15
	2.3.2	Magnitude of Water Use in Commercial Forestry:	
		An Historical Overview	18
2.4	Functi	oning of Afforestation Permit System (APS)	21
2.5	New I	Developments in Water Use Regulation	24
	2.5.1	Water Use Licensing	26
2.6	Summ	ary	28

CHAPTER 3

VALU	ING W	ATER: MODELS AND METHODOLOGIES	
3.1	Theore	etical Model for Valuing Water	29
3.2	A Rev	iew of Modelling Techniques	33
	3.2.1	Econometric Method	. 34
	3.2.2	Budgeting or Residual Method	34
	3.2.3	Mathematical Programming Method	34
	3.2.4	Contingent Valuation Method	35
	3.2.5	Hedonic Estimation	36
3.3	A Rev	iew of Water Valuation Studies	37
	3.3.1	Water Values in the Residential Sector	37
	3.3.2	Water Values in the Agricultural Sector	38
	3.3.3	Water Values in the Industrial Sector	41
	3.3.4	Water Values in Recreation and Aesthetics	42
	3.3.5	Water Values in Navigation	43
	3.3.6	Water Values in Hydropower	45
	3.3.7	Water Values in Waste Assimilation	46
3.4	A Brie	f Review of Water Demand Elasticities	48
3.5	Summ	ary	51

CHAPTER 4

VALU	ING WATER USE IN COMMERCIAL	
FORE	STRY: THE CONCEPTUAL FRAMEWORK	
4.1	Modelling Considerations	.52
	4.1.1 Defining Value, Price, and Tariff	52
	4.1.2 Selection of Tree Species	. 53
	4.1.3 Selection of Sites	54
	4.1.4 Defining Types of Water Use	55
	4.1.5 Defining Cost Assumptions	57
	4.1.6 Choice of Water Valuation Techniques	57
4.2	Empirical Models Employed	57
	4.2.1 Residual Value (RV) Method	58
	4.2.2 Marginal Value Product (MVP) Method	59
4.3	Sensitivity Analysis	59
4.4	Capitalized Values	60
4.5	Data Sources	61
4.6	Summary	61

CHAPTER 5

RESULTS AND DISCUSSIONS

5.1	Evapotranspiration (ET) Water Values by Residual Value (RV) Method
	for Eucalyptus and Pine
	5.1.1 Sensitivity Analysis
5.2	Evapotranspiration (ET) Water Values by Marginal Value Product (MVP)
	Method for Eucalyptus and Pine
	5.2.1 A Comparison of the Evapotranspiration (ET) Water Values Estimated by Residual Value (RV) and Marginal Value Product (MVP) Methods78

5.3	Streamflow Reduction (SFR) Water Values for Eucalyptus and Pine.	78
5.4	A Brief Comparison of All Water Values	81
5.5	Summary	82

CHAPTER 6

SUMMARY AND CONCLUSIONS

6.1	Introduction and Objectives	84
6.2	Method of Analysis, Assumptions, and Data Sources	86
6.3	Estimated Water Values and Policy Implications	88

REFERENCES	 90

APPENDICES

A:	The Relation between Timber Yield and Water Use for Eucalyptus grandis and Pinus Patula	99
B	Estimated Quadratic Functions	126
C	Computation of Cost Data	128
D	Computation of Water Values with and Without Land Costs	131
E:	Mathematical Interpretations of Water Values Estimated by Residual Value (RV) and Marginal Value Product (MVP) Methods	135