



Discussion Paper  
Series No. MEI 95/9

**Economic and  
Natural Resource  
Conditions in the  
Districts of Bagmati  
Zone and Their  
Implications for the  
Environment: An  
Adaptive Simulation Model**

Centre for Resource and  
Environmental Studies  
(CREST)

Copyright © 1995

International Centre for Integrated Mountain Development

All rights reserved

Published by

International Centre for Integrated Mountain Development  
G.P.O. Box 3226,  
Kathmandu, Nepal

Typesetting at ICIMOD Publications\* Unit

The views and interpretations in this paper are those of the author(s). They are not attributable to the International Centre for Integrated Mountain Development (ICIMOD) and do not imply the expression of any opinion concerning the legal status of any country, territory, city or area of its authorities, or concerning the delimitation of its frontiers or boundaries.

**Economic and Natural Resource  
Conditions in the Districts of  
Bagmati Zone and Their  
Implications for the Environment  
An Adaptive Simulation Model**

**Kamal Banskota  
and  
Bikash Sharma**

*MEI Series No. 95/9*

---

**Dr. Kamal Banskota, a resource economist, and Mr. Bikash Sharma, an  
agricultural economist, are professional staff of CREST**

---

October 1995  
International Centre for Integrated Mountain Development  
Kathmandu, Nepal

## Preface

This discussion paper was produced as one of the background papers for the preparation of an integrated economic and environmental development plan for the Bagmati Zone. The main purpose of the paper was to develop a better understanding of the economic and natural resource conditions in the districts of Bagmati Zone and their implications for the environment through use of an adaptive simulation model. Understanding these conditions is very important for the purpose of being better prepared to cope with the problems of rapidly deteriorating resources and the impact on food and fodder supplies, among others. Given the inability of small farmers to produce sufficient food on very small plots of land, together with the lack of off-farm employment opportunities, these farmers are forced to borrow at high interest rates from informal sources, worsening their economic condition with every passing year. The result of this is increasing marginalisation. A solution to the food and energy problem is essential. In order to come up with solutions a proper understanding of the interactions and interdependencies is necessary. It is hoped that this paper will be helpful in this respect.

# TABLE OF CONTENTS

	Page
<b>1. INTRODUCTION</b>	<b>1</b>
<b>Problem</b>	<b>1</b>
<b>Issues</b>	<b>2</b>
<b>Objectives of the Study</b>	<b>4</b>
<b>Limitations</b>	<b>5</b>
<b>Area Covered by the Study</b>	<b>6</b>
<b>Time Frame</b>	<b>6</b>
<b>Organisation of the Study</b>	<b>6</b>
<b>2. FRAMEWORK FOR AN ADAPTIVE POLICY SIMULATION MODEL</b>	<b>7</b>
<b>Introduction</b>	<b>7</b>
<b>Conceptual Framework</b>	<b>7</b>
<b>Major Assumptions</b>	<b>9</b>
<b>Linkages and Specification of Model</b>	<b>9</b>
<b>Exogenous Variables</b>	<b>10</b>
<i>Price</i>	<b>10</b>
<i>Population</i>	<b>11</b>
<i>District Area</i>	<b>11</b>
<b>Food Sector</b>	<b>12</b>
<i>Agriculture</i>	<b>12</b>
<b>Livestock</b>	<b>17</b>
<i>Livestock Population Forecast</i>	<b>18</b>
<i>Livestock Products' Supply</i>	<b>18</b>
<i>Bullocks</i>	<b>19</b>
<b>Natural Resources' Sector</b>	<b>19</b>
<i>Land Use Dynamics</i>	<b>19</b>
<i>Forest Area Adjustments</i>	<b>21</b>
<i>Forest Products' Supply and Demand</i>	<b>22</b>
<i>Deforestation</i>	<b>24</b>
<b>Other Activities</b>	<b>25</b>
<i>Labour Use</i>	<b>25</b>
<i>Trade</i>	<b>27</b>
<i>Income</i>	<b>28</b>
<i>Tourism</i>	<b>29</b>
<i>Horticulture</i>	<b>29</b>

<b>Environmental Sector</b>	<b>30</b>
<i>Carrying Capacity in Terms of Calories</i>	30
<i>Carrying Capacity in Terms of Fuelwood</i>	31
<i>Carrying Capacity in Terms of Fodder</i>	31
<b>Calibration</b>	<b>31</b>
<b>Sensitivity Analysis</b>	<b>32</b>
<b>Policy Scenarios and Impact Analysis</b>	<b>32</b>
<i>Population</i>	33
<i>Crop Sector Policies</i>	33
<i>Natoural Resource Policies</i>	34
<b>3. KABHREPALANCHOK DISTRICT</b>	<b>35</b>
<b>Performance of The District Economy</b>	<b>35</b>
<i>Introduction</i>	35
<i>Crop Area</i>	35
<i>Crop Yield</i>	36
<i>Fertiliser Use</i>	36
<i>Livestock</i>	36
<i>Land Use Changes</i>	38
<i>Price</i>	39
<b>Economic And Natural Resource Conditions: Baseline Scenario</b>	<b>39</b>
<i>Prices</i>	40
<i>Crop Area and Yield</i>	40
<i>Crop Production</i>	40
<i>Gross Margin</i>	41
<i>Livestock</i>	41
<i>Food Availability and Demand</i>	42
<i>Land Use</i>	42
<i>Forest Products</i>	42
<i>Labour Supply and Use</i>	43
<i>Trade</i>	44
<i>Income</i>	44
<b>Environment: Sustainability and Carrying Capacity</b>	<b>44</b>
<i>Implications for Food</i>	46
<i>Implications for Fuelwood</i>	46
<i>Implications for Fodder</i>	47
<b>Conclusion</b>	<b>47</b>
<b>Policy Scenarios And Impact Analysis</b>	<b>48</b>
<b>Crop Sector: Policy Scenarios and Impacts</b>	<b>48</b>
<i>Impact of Food Sector</i>	48
<i>Impact on Labour Use</i>	50
<i>Impact on Income</i>	50

<b>Natural Resources: Policy Scenarios and Impacts</b>	51
<i>Impact on Fuelwood</i>	53
<i>Impact on Timber</i>	54
<i>Impact on Fodder</i>	55
<b>Environment and Carrying Capacity</b>	56
<i>Pressure on the Resource Base</i>	56
<i>Carrying Capacity</i>	58
<b>Conclusion</b>	62

#### **4. SINDHUPALCHOK DISTRICT**

<b>Performance Of The District Economy</b>	85
<i>Introduction</i>	85
<i>Crop area</i>	85
<i>Crop Yield</i>	86
<i>Fertiliser Use</i>	87
<i>Livestock</i>	87
<i>Land Use Changes</i>	88
<i>Forest Plantation</i>	89
<b>Economic And Natural Resource Conditions: Baseline Scenario</b>	89
<i>Prices</i>	89
<i>Crop Areas and Yields</i>	89
<i>Crop Production</i>	90
<i>Gross Margin</i>	90
<i>Livestock</i>	90
<i>Food Availability and Demand</i>	91
<i>Land Use</i>	92
<i>Forest Products</i>	92
<i>Labour Supply and Use</i>	93
<i>Trade</i>	95
<i>Income</i>	95
<b>Environment: Sustainability and Carrying Capacity</b>	95
<i>Implications for Food</i>	97
<i>Implications for Fuelwood</i>	98
<i>Implications for Timber</i>	98
<i>Implications for Fodder</i>	98
<b>Conclusion</b>	99
<b>Policy Scenarios and Impact Analysis</b>	99
<i>Population Scenario and Impact</i>	99
<i>Crop Sector: Policy Scenarios and Impacts</i>	101
<i>Impact on the Food Sector</i>	101
<i>Impact on Trade</i>	105

<i>Impact on Labour Use</i>	106
<i>Impact on Income</i>	107

<b>Natural Resources: Policy Scenarios and Impacts</b>	108
<i>Impact on Fuelwood</i>	108
<i>Impact on Fodder</i>	110
<i>Impact on Timber</i>	110

<b>Environment and Carrying Capacity</b>	111
<i>Pressure on the Resource Base</i>	112
<i>Carrying Capacity</i>	113

<b>Conclusion</b>	116
-------------------	-----

<b>5. RASUWA DISTRICT</b>	147
---------------------------	-----

<b>Economic Performance of Rasuwa District</b>	147
<i>Introduction</i>	147
<i>Crop Area</i>	147
<i>Crop Yield</i>	148
<i>Fertiliser Use</i>	148
<i>Livestock</i>	149
<i>Land Use Changes</i>	149
<i>Tourism</i>	150
<i>Horticulture</i>	151

<b>Economic And Natural Resource Conditions: Baseline Scenario</b>	152
<i>Crop Area and Yield</i>	152
<i>Crop Production</i>	153
<i>Gross Margin</i>	153
<i>Livestock</i>	153
<i>Food Availability and Demand</i>	154
<i>Land Use</i>	155
<i>Forest Products</i>	155
<i>Labour Supply and Use</i>	157
<i>Horticulture</i>	157
<i>Tourism</i>	158
<i>Trade</i>	158

<b>Environment: Sustainability and Carrying Capacity</b>	159
<i>Implications for Food</i>	160
<i>Implications for Fuelwood</i>	160
<i>Implications for Fodder</i>	161

<b>Policy Scenarios and Impact Analysis</b>	161
<i>Introduction</i>	161
<i>Policy Alternatives</i>	162
<i>Impact Analysis</i>	162



Conclusion	164
------------	-----

6. NUWAKOT DISTRICT	186
---------------------	-----

Performance of the District Economy	186
-------------------------------------	-----

<i>Introduction</i>	186
---------------------	-----

<i>Crop Area</i>	186
------------------	-----

<i>Crop Yield</i>	187
-------------------	-----

<i>Fertiliser Use</i>	187
-----------------------	-----

<i>Livestock</i>	188
------------------	-----

<i>Land Use Changes</i>	189
-------------------------	-----

Economic and Natural Resource Conditions: Baseline Scenario	191
---	-----

<i>Prices</i>	191
---------------	-----

<i>Crop Area and Yield</i>	191
----------------------------	-----

<i>Crop Production</i>	191
------------------------	-----

<i>Gross Margin</i>	192
---------------------	-----

<i>Livestock</i>	192
------------------	-----

<i>Food Availability and Demand</i>	192
-------------------------------------	-----

<i>Land Use Changes</i>	193
-------------------------	-----

<i>Forest Products</i>	193
------------------------	-----

<i>Labour Supply and Use</i>	194
------------------------------	-----

<i>Trade</i>	195
--------------	-----

<i>Income</i>	195
---------------	-----

<i>Environment: Sustainability and Carrying Capacity</i>	196
--	-----

<i>Conclusion</i>	199
-------------------	-----

Policy Scenario and Impact Analysis	199
-------------------------------------	-----

<i>Introduction</i>	199
---------------------	-----

<i>Population Policy Scenario and Impact</i>	199
--	-----

<i>Crop Sector: Policy Scenarios and Impacts</i>	200
--	-----

<i>Natural Resource Base: Policy Scenarios and Impacts</i>	206
--	-----

<i>Environment and Carrying Capacity</i>	207
--	-----

<i>Conclusion</i>	211
-------------------	-----

7. DHADING DISTRICT	241
---------------------	-----

Performance of the District Economy	241
-------------------------------------	-----

<i>Introduction</i>	241
---------------------	-----

<i>Crop Area</i>	241
------------------	-----

<i>Crop Yield</i>	242
-------------------	-----

<i>Fertiliser Use</i>	242
-----------------------	-----

<i>Livestock</i>	243
------------------	-----

<i>Land Use Changes</i>	243
-------------------------	-----

<b>Economic and Natural Resource Conditions: Baseline Scenario</b>	<b>244</b>
<i>Crop Area and Yield</i>	244
<i>Crop Production</i>	245
<i>Gross Margin</i>	246
<i>Livestock</i>	246
<i>Food Availability and Demand</i>	247
<i>Land Use Changes</i>	248
<i>Forest Products</i>	249
<i>Labour Supply and Use</i>	250
<i>Trade Sector</i>	250
<i>Income</i>	251
<i>Environment: Sustainability and Carrying Capacity</i>	252
<i>Conclusion</i>	255
<b>Policy Scenarios and Impact Analysis</b>	<b>255</b>
<i>Introduction</i>	255
<i>Population Scenario and Impact</i>	256
<i>Crop Sector: Policy Scenario and Impacts</i>	257
<i>Natural Resource Sector: Policy Scenarios and Impacts</i>	264
<i>Environment and Carrying Capacity</i>	266
<i>Conclusion</i>	272
<b>8. CONCLUSIONS</b>	<b>310</b>
<b>Outcome</b>	<b>310</b>
<b>Further Scope of the Model</b>	<b>314</b>
<b>Data Requirements</b>	<b>316</b>
<b>REFERENCES</b>	<b>318</b>

Tables & Figures appear in the text according to in-text references to the same.