TECHNOLOGICAL CHANGE AND UNDERDEVELOPMENT:
A STUDY OF PUBLIC POLICY AND ORGANIZATIONAL
BEHAVIOUR IN THE RUBBER INDUSTRY OF SRI LANKA

by

N.J. Gunapala
B.P.A. (Sri Lanka), M.P.A. (York)

A thesis submitted to the Faculty of Graduate
Studies and Research, Carleton University, in
partial fulfillment of the requirements for
the degree of doctor of philosophy

Department of Political Science
Carleton University
Ottawa, Ontario, Canada
December 1979
ABSTRACT

This study examines the relationship between technological change and underdevelopment. Two interrelated problems are focused: identifying key determinants of the orientation of indigenous technological innovation, and assessing the consequences of technological change, including indigenous innovations, in the rubber industry of Sri Lanka in terms of socio-economic development or underdevelopment.

The relationship between technological change and under-development is viewed within the perspective of dependency theory. It is argued that in a poor country the development or underdevelopment orientation of technology is determined in two fundamental processes of technological change: the process of innovation, and the process of diffusion of technology. The process of innovation is seen as a decision-making process in which crucial choices determining the orientation of technology are made with respect to three elements of technology: the knowledge element, the economic element, and the social element. These choices are made under certain constraints determined by (i) the process of technology diffusion in the production system, (ii) the public policies for science and technology, and (iv) the value system of the scientific and technological community.

Technological change is assessed in terms of economic consequences -- impact on production linkages and methods of production -- and social welfare consequences -- satisfaction of human needs and income distribution. These consequences are assumed to have
been determined in the process of innovation and diffusion of technology.

The approach to the study is multi-disciplinary. Major sources of data are historical data, aggregate data, and survey research data. A sample of 63 professionals (17 public administrators, 35 R&D personnel, and 11 business administrators) in top and middle level management in some selected organizations dealing with policy-making, research and development, and manufacturing in the rubber industry are interviewed and their responses coded in machine-readable form. A set of hypotheses relating to (i) unequal relationships between the periphery and the centre, (ii) organization of production and diffusion of technology, (iii) socio-economic consequences of technological change, and (iv) dependency orientation of the process of innovation, is tested.

The study finds that the process of technological diffusion is closely associated with the patterns of dependency of the industry and its contribution to the socio-economic crisis of the country. The process of technological innovation itself is dependency oriented because the constraints under which the choices are made in that process have a strong dependency orientation. The patterns of demand that the production system generate help maintain the existing structures of dependent production. Public policy for the organization and financing of science and technology (S&T) activities supports the dependency patterns of technological change. There is a significant relationship between the value system of S&T personnel and the dependency patterns of innovations. The dependency
syndrome of the process of innovation is constituted of three basic components: the dependency orientation, the theoretical orientation, and the foreign linkage. Thus, the dependency syndrome is a state of mind of the individual who makes choices in the process of innovation.

Some of the important implications of the study are: (i) orientation of technology must receive priority over the expansion of local S&T capacity; (ii) re-structuring of the production system must be linked to S&T policy; (iii) the need for sectoral S&T policies adopting selective strategy is re-affirmed; (iv) integration of S&T institutions rather than differentiation, and an integrative approach to R&D project management is suggested; and (v) a new form of operational links between S&T and public policy institutions is urgent.
## CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>iii</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>vi</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xi</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xiii</td>
</tr>
<tr>
<td>ABBREVIATIONS</td>
<td>xv</td>
</tr>
</tbody>
</table>

### Chapter 1: INTRODUCTION | 1 - 9

1. The Society of Sri Lanka and Some Elements of Continuity - 10  
   (a) Pre-colonial Heritage - 11  
   (b) The Colonial Heritage: New Structures of Dependency - 17

2. Modern Sri Lanka's Development Patterns - 23

3. Conclusion - 41

### Chapter 2: DEVELOPMENT CRISIS OF SRI LANKA AND THE PROBLEM OF TECHNOLOGICAL CHANGE | 10 - 42

1. The Dependency Theory - 45  
   (a) Structures of Elites - 48  
   (b) Structures of Production System and Consumer Behaviour - 50  
   (c) Structures of the Science and Technology System - 54

2. Technological Change as a Decision-making Process - 68  
   (a) The Decision Context - 68  
   (b) The Decision of Technological Change - 72  
   (c) Evaluation of S/T Decision: Dependency vs. Development - 75  
   (d) Hypotheses - 80
Chapter 4: THE RUBBER INDUSTRY - A CASE OF DEPENDENCY

1. Introduction - 84
   (a) Rubber Production and Its Economic Importance - 84
   (b) Rubber Industry as a Primer of Development - 85

2. Primary Rubber Production and Linkages With Industrial Centres - 87
   (a) The Introduction of Rubber Production to Sri Lanka and the Economic Interests of the British Empire - 87
   (b) Rubber Production in Modern Sri Lanka - A New Linkage with Industrial Centres - 90
   (c) International Rubber Market and the Unequal Relationship Between the Industrial Centre and the Rubber Producing Countries - 95

3. The Development of Rubber Industry and New Linkage With Industrial Centres - 106
   (a) The Growth of Rubber Manufacturing - 106
   (b) The Organization of Production and Foreign Linkages - 111
   (c) Diffusion of Technology and Foreign Linkage - 117

4. The Development Impact of the Rubber Industry - 131
   (a) The Impact of the Rubber Industry on the Rest of the Economy
   (b) Contributions of the Rubber Industry to the Welfare of the Society - 136

5. Conclusion

Chapter 5: PUBLIC POLICY AND TECHNOLOGICAL DEPENDENCY - 149 - 213

1. Introduction - 149

2. Policy-making Institutes - 150
   (a) Colonial Heritage and the Post-Independence Confusion - 151
   (b) Organizational Behaviour of Policy-making Institutions - 156
3. Policy Support: The Organization of Science and Technology Institutions - 165
   (a) Dependency Patterns in the Organization of S/T Institutions - 165
   (b) An Analysis of the Organizational Policy Towards the S/T System - 180

4. Financial Support and the Dependency Patterns - 188
   (a) Funding Policy for the National S/T System - 188
   (b) Funding Policy for the S/T System Related to the Rubber Industry - 191

5. The Employment of Human Resources in the S/T System - 202

6. Laissez-faire Policy of No Demand from the S/T System - 208

7. Conclusion

Chapter 6: THE DEPENDENCY SYNDROME 215 - 262

1. The Dependency Orientation - 217
   (a) The Social Dimension - 217
   (b) Economic Impact - 218
   (c) Operational Definition of Dependency Orientation - 221
   (d) Dependency Orientation Scale - 225

2. Theoretical Orientation - 228
   (a) Theoretical Orientation in S/T Activities - 231
   (b) Theoretical Orientation as a S/T Norm - 231
   (c) Theoretical Orientation and Perceived Organizational norms - 232
   (d) Theoretical Orientation and Personal values - 233
   (e) Theoretical Orientation Scale - 234

3. Foreign Communication or Linkage with Advanced Countries - 236
   (a) Importance of Foreign Communication for Research Projects - 237
   (b) Importance of Foreign Communication for the Achievement of Organization's Goals - 238
4. The Dependency Syndrome - 242
   (a) Components of the Dependency Syndrome - 242
   (b) Some Correlates of the Dependency Syndrome - 245
   (c) Dependency Syndrome and Professional Experience - 251
   (d) Dependency Syndrome and System Linkages - 256

5. Conclusion

Chapter 7: CONCLUSIONS 264 - 278

APPENDIX A - Survey of Science and Technology Activities in the Rubber Industry of Sri Lanka 279 - 292

BIBLIOGRAPHY 293 - 308