



**CROSS - REGIONAL PRODUCTIVITY DIFFERENCES
AND THE EFFECT OF A GOVERNMENT PROGRAM:
The Case of Philippine Rice and Corn and
The Operation Land Transfer (OLT)**

RUEL C. LIMBO

A Dissertation Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Economics

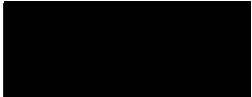
Faculty of Economics, Business and Law
University of New England
Armidale, NSW, Australia

December 1997

DECLARATION

I certify that:

- (a) the substance of this dissertation has not already been submitted for any degree and is not being currently submitted for any other degree, and
- (b) any help received in preparing this dissertation and all sources used have been acknowledged herein.



RUEL C. LIMBO

ACKNOWLEDGEMENTS

Finishing a dissertation is another feat, an achievement realized through hardwork, prayers, and assistance of other people. For this piece of work, I am indebted to various people who extended their expertise, time, and for some, their moral support. Some contributed indirectly, but nonetheless, usefully.

To Dr. Oscar Cacho for the overall guidance; for correcting the initial chapters and the whole manuscript; for not failing to put constructive and encouraging comments; and for the assistance with Matlab. For all of these, *¡Muchas Gracias!*

To Dr. D.S. Prasada Rao for his innovative ideas, for improving the structure of the framework and methods chapter and for enriching the methodological aspect of the study given the available data. To Prasada, *Dhanyawad!*

I greatly thank those two persons for sharing their time, and pieces of their minds to improve my work.

The data utilized in this study were essential, like cells to a body tissue. Hence, it is proper to acknowledge the people from the BAS: Cynthia, Ana, Adel and Grace from the Agricultural Accounts and Statistical Indicators Division, Nora Abaya from the Information Division, Connie Gomez from the Cereals Section, Jane Capila from the Marketing Division, and others. Other people worthy of thanks are the staff of the DAR, DOLE, NSCB, NEDA, NIA, FPA, IASt, IRRI and ACPC libraries.

To the people who gave useful comments during the seminar, Bayra, Arief, Stephen, Prof. Roley Piggott and Dr. Euan Fleming. To my flatmates, Leonard and Gal for their presence during the seminar which gave me moral support.

To Angie Njuguna and Tina Cruz for sharing their ideas on OLS and other econometric aspects on various occasions.

To my colleagues for the notes, ideas, internet jokes and sometimes, frustrations which we shared along the way during the last 5 struggling months or work, Mary Milne, Mary Juma and Beth Catudan.

To my officemates back home particularly the IMR unit at DAR's Field Operations Group for serving as data gatherers during the time when data gaps needed to be filled up: Atoy, Alex and Lito and the rest for sending their warm regards which are important for continuing to survive in a foreign country. To Carol Baltazar for managing my finances and Jing for their sisterly concern.

To Asec. Madronio for some useful insights on OLT and to some staff of the Center for Operation Land Transfer for sharing information on other OLT aspects.

To Gigi Hidalgo for sending some publications from the ADB Library and for the interesting and inspirational thoughts she shared through the net.

To Dennis Bautista for always taking the time off to gather and send other data, numerous to mention; for always being available, and for a life-long friendship.

To Rigo Castro for providing moral support and prayers; for constantly reminding me that everything, the tough and good times, will come to pass.

To the Filipino students of UNE for providing a home away from home. To the good company which provided relief during stressful days: Bernie, Kim, Angie, Beth, Luz, Gina, Pearl, Flor, Ruthie and Angelita. To Gal for his computer which I used on many occasions and more importantly, for his person, for being a good listener.

To some girls back home who at different points in time, my thoughts for them inspired me to pursue: Arlie, and Greigh.

A dedication is worthy to my family, To Tatay, Inay (posthumously), Helen and Kuya Cerry and the coming twins; and Gina; with good intentions behind all these.

To AusAID for granting me this opportunity to study in Australia.

Finally and most importantly, to God almighty for all the life's challenges; from whom all things come...

Ruel Corachea Limbo

ABSTRACT

The principal objective of the study was to analyze the differences in regional productivity of rice and corn and determine the effects of Operation Land Transfer (OLT) on rice and corn productivity in the Philippines. Regional TFP indices for rice and corn were constructed using 1991 data and the effects of OLT, other services and regional factors on TFP were determined.

The constructed input, output and TFP indices show how the values differ as affected by price and quantity aggregation. The Fisher indices lay between Laspeyres and Paasche indices.

In terms of regional differences, it was observed from the indices that outputs varied more widely than inputs across regions. This implies that the variation in TFP across region can be attributed more to output than to input. In general, there were variations in the relative sizes of input and output indices across regions, but in terms of TFP indices, the relative position of each region with respect to the base did not vary widely.

Southern Mindanao and Central Luzon exhibited the highest aggregate TFP although the output index was higher for Central Luzon. Aggregation affected the relative ranking of regions in terms of TFP. For rice, Southern Mindanao, Cagayan Valley and Central Luzon led while for corn, Central, Southern and Northern Mindanao regions dominated. In general, aggregate TFP values lay between rice and corn TFPs, except for a few cases.

From the OLS results, OLT had a positive overall effect upon rice and corn aggregate TFP. The results were relatively better for rice than for corn. This was because most of OLT land distribution and the corresponding support services, like irrigation and including those which were not part of the Comprehensive Agrarian Reform Program (CARP), were extended to rice regions which has a larger share at the program. Also from OLS, the irrigation variable showed significant effects for rice TFP while the effects of credit and rainfall were not significant.

TABLE OF CONTENTS

CHAPTER 1 - INTRODUCTION

1.1 Background	1
1.2 The Research Problem	3
1.3 Importance of the Study	4
1.4 The Research Objectives and Hypotheses	5
1.5 Organization of the Study	6

CHAPTER 2 - OVERVIEW OF THE REGIONS, SECTORS AND OLT

2.1 Introduction	7
2.2 The Philippine Regions	7
2.3 The Rice Sector	11
2.3.1 Production	11
2.3.2 Consumption	14
2.3.4 Prices	16
2.4 The Corn Sector	17
2.4.1 Production	17
2.4.2 Consumption	18
2.4.3 Prices	20
2.5 The Operation Land Transfer (OLT)	20
2.5.1 The OLT Land Distribution Process	22
2.5.2 OLT Scope and Accomplishment	24
2.5.3 The OLT Support Services	27
2.6 Comments and Conclusion	30

CHAPTER 3 - REVIEW OF RELATED STUDIES

3.1 Introduction	31
3.2 Productivity and Output Growth Over Time	31
3.3 Regional Productivity Differences	34
3.4 Internal Consistency of Index Numbers	36
3.5 Land Reform and Productivity	37
3.6 Induced Innovation and Aggregate Productivity	40
3.7 Comments and Conclusion	41

TABLE OF CONTENTS

CHAPTER 4 - RESEARCH FRAMEWORK AND METHODS

4.1 Introduction	43
4.2 Total Factor Productivity (TFP) Measurement	43
4.2.1 The TFP Theory and Measurement	43
4.2.2 The TFP Indices	45
4.3 Interspatial Total Factor Productivity (TFP)	47
4.4 TFP Indices for Cross-Regional Comparisons	48
4.4.1 Transitivity	48
4.4.2 Choice of Binary Index Form	50
4.4.3 EKS-CCD Approach	50
4.4.4 Paasche-Laspeyres Spread: A Distance Measure of Reliability	52
4.4.5 Minimum Spanning Tree (MST)	53
4.4.6 Regional Contiguity and TFP Indices	55
4.5 Regression Analysis of OLT and Other Variables	56
4.5.1 Regional TFP Indices, OLT and Other Variables	57

CHAPTER 5 - THE DATA

5.1 Introduction	59
5.2 Data Sources	59
5.2.1 Outputs	59
5.2.2 Factor Inputs	60
5.2.3 The Costs and Returns Survey (CRS)	60
5.2.4 OLT and Other Data	61
5.3 Data Limitations	62
5.3.1 Outputs	63
5.3.2 Factor Inputs	63
5.3.3 The Costs and Returns Survey (CRS)	64
5.3.4 OLT and Other Data	65
5.4 Construction of Data Series	66
5.4.1 TFP Estimation	66
5.5 Comments and Conclusion	68

TABLE OF CONTENTS

CHAPTER 6 - RESULTS AND DISCUSSION

6.1 Introduction	69
6.2 Output, Input and Area Indices	69
6.2.1 Output and Area Indices	69
6.2.2 Input Value Shares	72
6.3 TFP Indices, The EKS Method	76
6.3.1 Input, Output and TFP Indices	77
6.3.2 The TFP Indices, Interpretation and Implications	77
6.4 Minimum Spanning Tree (MST) Method and TFP Indices	82
6.4.1 Distance Matrices	82
6.4.2 Minimum Spanning Trees	83
6.4.3 Matrices of Transitive Index Numbers	91
6.5 Regression Analysis	91
6.5.1 Effects of OLT and other Productivity Variables on TFP	93
6.4 Comments and Conclusion	97

CHAPTER 7 - SUMMARY AND CONCLUSION

7.1 Introduction	98
7.2 Summary of Chapters	98
7.3 Major Findings	99
7.4 Policy Implications	101
7.5 Recommendations for Future Research	102

BIBLIOGRAPHY	104
---------------------	-----

APPENDIX	114
-----------------	-----

LIST OF TABLES

Table	Page
2.1 A Summary Profile of Philippine Regions	9
2.2 Value of Agricultural Production Including Rice and Corn, 1991, In Current Prices	12
2.3 Rice Production and Use Estimates by Region, 1991 (In '000 m.t. of milled rice)	15
2.4 Physical Area of Rice and Corn and OLT Scope, Accomplishment and Remaining Workload	25
2.5 OLT Lands in 1991 and Completed Irrigation and Small Water Impounding Projects under CARP, As of 1991	29
3.1 Summary of Annual Growth Rates on Outputs, Inputs and Productivity, Philippine Agriculture, Selected Periods	33
3.2 Summary of Previous Studies on Effects of OLT/Land Reform on Farm Productivity	38
6.1 Rice and Corn Regional Aggregate Output Indices	71
6.2 Rice Input Value Shares by Region, 1991	73
6.3 Corn Input Value Shares by Region, 1991	75
6.4 Indices of Input, Output and TFP, based on Transitive-Fisher (EKS) Method)	78
6.5 Indices of Input, Output and TFP, based on Minimum Spanning Trees (MST) Method	79
6.6 Rice and Corn Aggregate Input Indices Distance Matrix	84
6.7 Rice and Corn Aggregate Output Indices Distance Matrix	85
6.8 Rice and Corn Aggregate TFP Indices Distance Matrix	86

LIST OF TABLES

Table	Page
6.9 Absolute Percent Difference between EKS and MST Derived Indices	92
6.10 Regression Results for the Effects of OLT and Other Variables on TFP	94
6.11 Correlation Matrices of TFP Explanatory Variables	96

LIST OF FIGURES

Figure	Page
2.1 Map of the Philippines Showing Regional Delineation	8
2.2 Regional Trends in Rice Yield per Hectare, 1973-1995	11
2.3 Trend in Rice and Corn Real Prices, 1973-1995	16
2.4 Regional Trends in Corn Yield per Hectare, 1973-1995	18
2.5 Trend in Approval of Claims by LBP, 1974-1989	26
2.6 Trend in OLT Accomplishment, 1972-1995	28
4.1 Some Simple Spanning Trees	53
4.2 A Contiguity Diagram for Philippine Regions	56
6.1 Rice and Corn Area Indices, 1973-1995	70
6.2 Effect of Agregation on Regional TFP	81
6.3 Rice Input Indices Minimum Spanning Tree	88
6.4 Aggregate Input Indices Minimum Spanning Tree	88
6.5 Corn Input Indices Minimum Spanning Tree	88
6.6 Aggregate Output Indices Minimum Spanning Tree	90
6.7 Aggregate TFP Indices Minimum Spanning Tree	90