

**AN ECONOMIC EVALUATION OF INTEGRATED PEST
MANAGEMENT PRACTICES IN ENGLISH CABBAGE
PRODUCTION IN CAMERON HIGHLANDS,
MALAYSIA**

By

HAIRUDDIN MOHD. AMIR

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in
Fulfilment of the Requirement for the Degree of Master of Science**

DECEMBER 2006

***THIS THESIS IS SPECIALLY DEDICATED
TO MY BELOVED PARENTS, FATHER (PASSED AWAY IN 1991),
MOTHER (FATIMAH),
WIFE (NORHANI),
CHILDREN (ELIYANA, SHAHMIR, NADIA, LUKMAN HAKIM), BROTHER,
SISTER AND
THE REST OF MY FAMILY,
WITHOUT WHOSE SUPPORT AND
TRUST THIS STUDY COULD NEVER HAVE BEEN COMPLETED.***

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

**AN ECONOMIC EVALUATION OF INTEGRATED PEST MANAGEMENT
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December 2006

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Faculty : Agriculture

Anxieties about negative effects of pesticide use in developing countries have motivated the development of Integrated Pest Management (IPM) programs in these countries. In Malaysia, the IPM collaborative research support program (CRSP) was established to specifically address the widespread misuse of pesticides in cabbage vegetable cultivation in Cameron Highlands, one of the major vegetable producing regions in the country.

IPM adaptations in cabbage production initiatives include research on the optimal use of pesticides, complementary weed control strategies, and alternative cultural and biological controls. The program would generate benefits that can be measured in economic terms. These benefits include improvements in water quality, food safety, pesticide application safety, and long run sustainability of pest management systems.

This study aims to measure the health and environmental benefits of the IPM programs in cabbage cultivation in Cameron Highlands. A primary data collection from 102 cabbage farmers in three zones of Cameron Highlands was undertaken to identify farm and farmer characteristics, pesticide usage, pest management practices, perceptions about pesticide hazards, awareness of IPM strategies, and willingness to adopt specific technologies being developed under the IPM program. In addition, a contingent valuation survey was used to evaluate farmers' willingness-to-pay to avoid risks of pesticides use in different environmental categories namely human, beneficial insects, aquatic life, birds, and farm animals.

A comprehensive measure of the benefits of the IPM program was undertaken by 1) identifying the hazards related to pesticide usage, 2) providing an ex ante measure of program impacts on pesticide usage, 3) predicting IPM adoption rates, and 4) estimating society's willingness-to-pay to avoid health and environmental risks from pesticides under Malaysian conditions. An estimate of the amount of risks avoided because of IPM adoption was combined with farmers' willingness to pay bids for risk avoidance to derive a monetary value of the program benefits. The estimated economic benefits of the IPM to farmer residents in the three zones in Cameron Highlands amounted to RM 33,354 for one Cabbage season.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

**ANALISIS EKONOMI TERHADAP AMALAN PENGURUSAN SERANGGA
PEROSAK BERSEPADU DALAM PENGELUARAN KOBIS DI
CAMERON HIGHLANDS, MALAYSIA**

Oleh

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Keprihatinan terhadap kesan penggunaan racun oleh negara-negara sedang membangun telah mendorong negara-negara berkenaan untuk membangunkan satu program pengurusan serangga perosak bersepadu (IPM). Di Malaysia program penyelidikan dan sokongan IPM telah di ujudkan khusus bertujuan menyelesaikan masalah penggunaan lebihan racun perosak pada tanaman sayuran terutamanya jenis Brassicas seperti kubis di Cameron Highlands yang merupakan kawasan pengeluaran utama sayuran tanah tinggi.

Adaptasi IPM di dalam pengeluaran kubis meliputi penyelidikan penggunaan racun perosak secara optimum, teknik pelengkap dalam pengawalan rumpai, dan amalan pengawalan perosak secara biologi. Jika berjaya, keberkesanan program ini boleh di ukur melalui kaedah ekonomi. Faedah program IPM meliputi penambahbaikan di dalam kualiti air, keselamatan makanan, keselamatan pengguna racun, dan dapat memberi satu sistem pengurusan perosak yang mampan di dalam jangka panjang.

Kajian ini dilakukan untuk mengukur faedah dari hasil penggunaan teknik IPM ke atas faktor kesihatan dan persekitaran di Cameron Highlands. Soal selidik di jalankan kepada 102 pekebun kubis di tiga zon di Cameron Highlands untuk mengenal pasti sosioekonomi pemilik dan kriteria ladangnya, menentukan impak dari penggunaan racun perosak, tahap amalan pengurusan perosak, tanggapan pekebun terhadap kesan racun perosak, keprihatinan terhadap strategi IPM, kesanggupan untuk terima pakai teknologi IPM dalam pengeluaran kubis, dan seterusnya menilai kesanggupan membayar pekebun terhadap racun perosak yang dapat menghindarkan kesan buruk ke atas kesihatan dan alam sekitar.

Satu langkah yang komprehensif untuk mengukur faedah program IPM telah dilaksanakan dengan 1) mengenal pasti kesan-kesan buruk dari penggunaan racun perosak, 2) mengira kesan impak dari penggunaan racun perosak, 3) mengira tahap terima pakai teknik IPM, dan 4) mengukur kesanggupan membayar pekebun terhadap penghindaran risiko kesihatan dan persekitaran impak dari penggunaan racun perosak. Faedah program IPM dikira dengan menjumlahkan tahap terima pakai IPM digabungkan dengan kesanggupan membayar pekebun terhadap racun perosak yang rendah kesan kimia. Faedah ekonomi kesan dari impak program IPM bagi ketiga-tiga zon di Cameron Highlands adalah sebanyak RM33,354 semusim.

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I certify that an Examination Committee met on _____ to conduct the final examination of Hairuddin bin Mohd. Amir on his Master of Science thesis entitled “An Economic Evaluation of Integrated Pest Management Practices in English Cabbage Production in Cameron Highlands, Malaysia” in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulation, 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

HAIRUDDIN MOHD. AMIR

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TABLE OF CONTENTS

	Page
DEDICATION	ii
ABSTRACT	iii
ABSTRAK	v
ACKNOWLEDGEMENTS	vii
APPROVAL	x
DECLARATION	xii
LIST OF TABLES	xvi
LIST OF FIGURES	xix
LIST OF ABBREVIATIONS	xx
CHAPTER	
1 INTRODUCTION	1.1
1.1 Problem Statement	1.5
1.2 Objectives of the Study	1.8
1.3 Significance of the Study	1.8
1.4 The Study Area	1.9
1.5 Organization of the Study	1.14
2 VEGETABLE INDUSTRY and INTEGRATED PEST MANAGEMENT	2.1
2.1 Vegetable Industry in Malaysia	2.1
2.1.1 Land Area	2.3
2.1.2 Production and Cost Structure	2.5
2.1.3 Consumption	2.6
2.1.4 Trade	2.7
2.2 Cabbage Production	2.15
2.3 Use of Agricultural Chemicals in Malaysia	2.15
2.4 Integrated Pest Management in Vegetable Production	2.17
2.5 Economic Threshold of Integrated Pest Management Practices	2.19
3 LITERATURE REVIEW	3.1
3.1 State of Knowledge and Previous Studies	3.1
3.2 Methods Used to Measure Health and Environmental Benefits	
3.2.1 Valuation from the Cost-Side	3.5
3.2.2 Valuation from the Benefit-Side	3.6
3.2.3 Market-Oriented Approach	3.7
3.2.4 Valuation Using Surrogate (or Implicit) Markets	3.7
3.2.5 Marketed Goods as Proxies for Non-marketed Goods	3.11
3.2.6 Survey Oriented Approach	3.12
3.3 Other Methods of Environmental Assessment	3.14

3.4	Conclusion the Methods of Environmental Assessment	3.17
4	METHODOLOGY	4.1
4.1	Benefit Analysis framework	4.1
4.2	Evaluating the Benefits of an IPM Program	4.4
4.3	STEP 1: Identification and Classification of the Relevant Environmental Impacts of Pesticide Use in the Study Area	4.7
4.3.1	Impact Categories	4.8
4.4	STEP 2: Evaluating the Level of Pesticide Impacts on Human Health, Mammalian Farm Animals, Birds, Beneficial Insects, and Aquatic Species	4.13
4.4.1	Pesticide Impacts Rating Scheme.	4.16
4.4.2	The Criteria for Evaluating Pesticide Impacts	4.24
4.4.3	The Environmental Impact Scoring System.	4.38
4.5	STEP 3: Measuring the Rate of Adoption of the IPM Technologies.	4.40
4.5.1	The Model	4.43
4.5.2	The Regressors	4.46
4.5.3	The Dependent Variables	4.52
4.6	STEP 4: Assessing Effects of IPM Adoption on Pesticide Use	4.52
4.6.1	The IPM Research Activities/Technologies Selected for Evaluation	4.53
4.7	STEP 5: Estimating Society's Willingness-to-Pay to Reduce Pesticide Risks	4.58
4.7.1	Contingent Valuation Methods and Willingness to Pay.	4.58
4.8	STEP 6: Estimating the Benefits of the IPM-program in Malaysia	4.63
4.9	Data Analysis	4.64
4.9.1	Descriptive Analysis	4.64
4.9.2	Logit Regression Analysis	4.64
4.9.2	Contingent Valuation Method (CVM)	4.65
4.10	Data Collection and Sampling	4.66
4.11	Analysis Tools	4.67
5	RESULTS AND DISCUSSION	5.1
5.1	Descriptive Analysis	5.1
5.1.1	The Socio-economic Profile	5.2
5.1.2	Farm Characteristics and Operations	5.6
5.1.3	Pest Management	5.10
5.2	Perceptions about the Environmental Impacts of Pesticide Use	5.17
5.3	Summary of Survey Results	5.19
5.4	Results of the Evaluation of the IPM Program	5.20
5.4.1	The Environmental Categories	5.21
5.4.2	The Pesticide Impact Scores	5.21
5.4.3	Willingness to Adopt IPM Technologies	5.24
5.4.4	Data Issues	5.26
5.5	Factors Affecting Willingness to Adopt IPM Technologies	5.28

5.6 Goodness of Fit Measures	5.34
5.7 Estimated Adoption Rates based on Logistic Regression	5.35
5.8 Estimation of Society's Willingness-to-Pay for Reduction in the Risks Posed by Pesticides to the Five Environmental Categories	5.36
5.9 The Economic Benefits of the Health and Environmental Impacts of IPM Adoption	5.44
6 SUMMARY AND CONCLUSIONS	6.1
6.1 Introduction	6.1
6.2 Major Contributions	6.4
6.3 Policy Implications	6.5
6.4 Conclusions, Limitations, and Recommendations for Future Research	6.6
REFERENCES	R.1
APPENDICES	A.1
BIODATA OF THE AUTHOR	G.1

LIST OF TABLES

Table	Page
1.1 Numbers of Cabbage Growers in Cameron Highlands, Pahang	1.12
1.2 Monthly Average Vegetable Production in Cameron Highlands	1.13
2.1 Hectares of Selected Vegetables in Malaysia 1995-2010	2.4
2.2 Production of Selected Vegetables in Malaysia 2000-2010	2.5
2.3 Production Cost of Cabbage per Kilogram, 2003	2.6
2.4 Vegetable Balance of Trade and Consumption in Malaysia	2.7
2.5 Malaysia Imports of Selected Vegetables, 2000 – 2005	2.10
2.6 Imports of Selected Vegetable by Countries, 2000 - 2005	2.11
2.7 Exports of Selected Vegetable, 2000 – 2005	2.13
2.8 Exports of Selected Vegetable by Countries, 2001 - 2005	2.14
2.9 Total end-users' value of agricultural chemicals Malaysia, 1993 – 2002 (RM million)	2.16
4.1 Toxicity Indicators by Environmental Category	4.22
4.2 Exposure Indicators by Environmental Category	4.23
4.3 Criteria Matrix for WHO Classification of Pesticides by Acute Hazards	4.25
4.4 Criteria Matrix for U.S. EPA Classification of Pesticides by Acute Human Health Hazards	4.26
4.5 Assignment of Acute Human Health Toxicity Ratings Based on the WHO and the EPA Pesticide Classification Schemes	4.27
4.6 Assignment of Risk Levels for Human Chronic Toxicity	4.28
4.7 EPA Classification of Chemicals According to the Weight of Evidence (WOE) from Epidemiologic and Animal Studies	4.29

4.8	The IARC Carcinogenicity Classification System	4.29
4.9	Assignment of Surface Water Risk to an active ingredient based on Surface Water Matrix developed by USDA-SCS	4.31
4.10	Surface Water Risk Levels using Pesticide Characteristics	4.31
4.11	Assigning Groundwater Risk Levels based on the Pesticide Leaching Matrix	4.32
4.12	Assignment of Risk Levels based on the Groundwater Ubiquity Score	4.33
4.13	Assignment of Hazard Levels to Aquatic Organisms based on Different Toxicological Endpoints	4.35
4.14	Assignment of Risks to Beneficial Arthropods using EIQ scores	4.37
4.15	Pesticide Impacts Scoring System	4.39
4.16	Summary Statistics and Definitions of the Regressors	4.47
4.17	Dummy Table of Willingness to (WTA) Responses by Technology package	4.53
4.18	List of Survey Variables by Category	4.69
5.1	The Socio-economic Profile of Farmers in North, Central, and South, 2003 - 2005 Producer Survey	5.3
5.2	The Mean Values of Personnel Attributes	5.4
5.3	Indicators of Pesticide Exposure	5.5
5.4	Summary of Farm Characteristics	5.7
5.5	Pest Control Methods Used for the Cabbage System in Northern, central and Southern Zones Cameron Highlands (2004 – 2005)	5.14
5.6	Percentage Responses about Source of Pest Control Advice by Zones	5.15
5.7	Percentage Responses by Decision Factor	5.16
5.8	Knowledge of IPM Concepts among the Survey Groups	5.17

5.9	Cabbage Farmers' Perceptions about Pesticide Impacts	5.18
5.10	Order of Importance of the Five Impact Categories	5.19
5.11	Risk/Impact Scores of Cabbage Pesticides used in the Study Area by Environmental Category	5.22
5.12	Farmers' Willingness to Adopt IPM Technologies in North, Central, and South, 2003-2004 Surveys	5.25
5.13	Mean Values of General Socio-Economic Attributes: 2000 Baseline Survey and 2004 Producers' Survey	5.26
5.14	IPM Adoption Models: Logistic Regression Results	5.29
5.15	Goodness-of-Fit Measures/Predictive Ability of the Logit Models	5.35
5.16	Predicted Adoption Rates by Site (Region)	5.36
5.17	Summary Statistics for the Choice Variables in the WTP Models	5.38
5.18	Summary Statistics for the Dependent Variables Mean WTP (Ringgit Malaysia) Standard Deviation	5.39
5.19	Estimated and Adjusted Willingness to Pay Values for Risk	5.39
5.20	Avoidance by Impact Category	5.41
5.21	Willingness to Pay Human Health Models: Logit Regression Results	5.42
5.22	Willingness to Pay Human Beneficial Insects Models: Logit Regression Results	5.42
5.23	Willingness to Pay Human Aquatics Models: Logit Regression Results	5.43
5.24	Willingness to Pay Human Birds Models: Logit Regression Results	5.43
5.25	Willingness to Pay Human Farm Animals Models: Logit Regression Results	5.44
5.26	Percentage Changes in Ecological Ratings Induced by the Impact of IPM on Pesticide Use Patterns for One Cropping Season	5.46
5.27	The Estimated Benefits of IPM by Category Cost Savings from Adoption of IPM Technologies	5.47

LIST OF FIGURES

Figure	Page
1.1 Malaysian Maps	1.11
1.2 Maps of Cameron Highlands Pahang, Malaysia	1.11
2.1 Per capita consumption of vegetable in Malaysia, 1985 – 2005	2.7
2.2 Percentage of end-user' value of agricultural chemicals Malaysia, 1993 – 2002	2.16
2.3 IPM Package for DBM control in Malaysia	2.21
4.1 Major Components of a Benefit Analysis of a Change in Pesticide Use	4.3
4.2 Approach to Evaluating the Benefits of the IPM Program	4.6
5.1 Average Farm Size and Cabbage acreage in Northern, Central, and Southern Region, 2004 Producer Survey	5.8
5.2 Average Cabbage Production in Northern, Central, and Southern Region; 2003- 2004, (Kg/Acre/Season)	5.8
5.3 Average Income Generated from Cabbage, and Off-Farm Sources in Northern, Central, and Southern zones, 2003-2005 Cropping Season	5.9
5.4 Farm Wages for Spraying, Hand weeding, and Harvesting in Northern, Central, and Southern zones, 2003-2005 Cropping Season	5.9
5.5 Average Amount of Pesticide Active Ingredients Applied by Farmers in Northern, Central, and Southern Zone (kg/acre), 2003-2004 Cabbage Season	5.13
5.6 Proportion of Total Costs Spent on Pesticides of the Total operating expenses among Farmers in Northern, Central, and Southern Zone, 2003-2004 Cabbage Seasons	5.14

LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
BT	Bacillus Thuringiensis
CFV	Chemical Free Vegetable
CI	Confidence interval
CRSP	Collaborative Research Support Program
CVM	Contingent Valuation Method
DOA	Department of Agriculture
EC ₅₀	Median effective concentration
ED ₅₀	Median effective dose
ETL	Economic Thresholds Level
FAMA	Federal Agriculture Marketing Authority
FOA	Food and Agricultural and Directory Index
HGV	Hydroponics Grown Vegetables
IPM	Integrated Pest Management
JKR	Department of Public Workers
LC ₅₀	Median lethal concentration
LD ₅₀	Median lethal dose
MADI	Malaysia Agricultural and Directory Index
MARDI	Malaysian Agriculture Research and Development Institute
MRL	Maximum residue limit
MOA	Ministry of Agriculture and Agro-base Industries Malaysia

NAP3	Third National Agriculture Policy
ppm	Parts per million
UPM	Universiti Putra Malaysia
USM	Universiti Sains Malaysia
WTP	Willingness to Pay