UNIVERSITI PUTRA MALAYSIA

ECONOMIC VALUATION OF MEDICINAL PLANTS IN PENINSULAR MALAYSIA

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By

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

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DEDICATION

This thesis is dedicated to my dearest wife, Khairiah Marzuki, and my two lovely sons, Muhammad Syafiq Ashraf and Muhammad Hilmi, and also to my parents for their moral support and patience in all my studies.

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

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Faculty: Forestry

Medicinal plants are known as important non-timber forest products (NTFPs), besides bamboo and rattan, which have had great demand by rural people and the industries lately. The increasing awareness of herbal remedies and the demand of herbal products have led to crucial requirement of the local resources by the traditional medicine industries. For sustainable management of medicinal plants in the forest, there is a need to place proper values (potential and extracted values) that reveal the importance of these resources. These values could increase the environmental benefits, important to decision-makers, that affect the environment if optimal choices are to be made. By using market price approach, the economic values (residual value) of medicinal plants were estimated at three study sites, namely Gunung Raya, Bukit Perak and Gunung Jerai Forest Reserves at Kedah, Peninsular Malaysia. From the industrial and collectors survey, the status of the total requirement and total collection of the resources was determined. Input-use efficiency in the harvesting activities of medicinal plants was also examined. The study revealed that the average total residual values for medicinal plants

per hectare in Gunung Raya Forest Reserve were RM1,654.87, RM3,746.07 at Bukit Perak Forest Reserve and RM964.53 at Gunung Jerai Forest Reserve. The total requirement of local medicinal plants by the industries (476,339 kg) per year were found exceeding the total collection of medicinal plants (103,620 kg) per year, showing the high dependency of traditional medicine industries on the local resources. From the production function analysis, the workers and harvesting tools were insufficiently used during the harvesting session. Without proper monitoring and management, the unbalanced situation of medicinal plants' demand and supply could become more critical in the years to come. Some relevant measures were recommended from this study.

PERPUSTAKAAN SULTAN ABDUL SAMAD
UNIVERSITI PUTRA MALAYSIA

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

PENILAIAN EKONOMI TUMBUHAN UBATAN DI SEMENANJUNG MALAYSIA

Oleh

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April 2004

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Tumbuhan ubatan merupakan hasil hutan bukan kayu yang penting selain daripada buluh dan rotan dan mendapat permintaan tinggi daripada penduduk luar bandar dan industri sejak kebelakangan ini. Peningkatan dalam kesedaran berkenaan rawatan herba dan permintaan produk herba telah menyebabkan keperluan yang amat tinggi terhadap sumber-sumber tempatan tersebut oleh industri perubatan tradisional. Untuk mencapai pengurusan secara berkekalan bagi tumbuhan ubatan dari sumber hutan, adalah perlu bagi menetapkan nilai yang sewajarnya (nilai potensi dan nilai kutipan) yang mengambarkan kepentingan sumber tersebut. Nilai ini dapat meningkatkan nilai faedah yang boleh diperolehi daripada persekitaran dan penting bagi pembuat keputusan/polisi yang mempengaruhi alam sekitar sekiranya pilihan optima hendak dilakukan. Dengan menggunakan pendekatan harga pasaran, nilai ekonomi (nilai tinggalan) bagi tumbuhan ubatan telah dianggarkan di tiga lokasi kajian iaitu, Hutan Simpan Gunung Raya, Hutan Simpan Bukit Perak dan Hutan Simpan Gunung Jerai di Kedah, Semenanjung Malaysia. Dari kajian ke atas industri dan pengambil tumbuhan ubatan, status jumlah keperluan dan jumlah pengambilan sumber tersebut dapat ditentukan. Kecekapan penggunaan

input dalam proses pengambilan tumbuhan ubatan juga telah diselidiki. Kajian telah mendapati bahawa purata nilai tinggalan tumbuhan ubatan per hektar di Hutan Simpan Gunung Raya adalah RM1,654.87, RM3,746.07 di Hutan Simpan Bukit Perak dan RM964.53 di Hutan Simpan Gunung Jerai. Jumlah keperluan tumbuhan ubatan tempatan oleh industri (476,339 kg) setahun didapati melebihi jumlah pengambilan tumbuhan ubatan (103,620 kg) setahun yang menunjukkan bahawa adanya kebergantungan yang tinggi oleh industri perubatan tradisional terhadap sumber tempatan. Dari analisa fungsi pengeluaran, pekerja dan alatan yang dibawa telah tidak digunakan dengan cekap ketika proses pengambilan tumbuhan ubatan. Tanpa pengawasan dan pengurusan yang sesuai, situasi yang tidak seimbang oleh permintaan dan penawaran tumbuhan ubatan akan menjadi lebih kritikal pada masa hadapan. Beberapa langkah kawalan berkaitan juga telah dicadangkan dari kajian ini.

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LIST OF ABBREVIATIONS

AHFR	-	Air Hitam Forest Reserve
BCA	-	Benefit-cost Analysis
B/C Ratio	-	Benefit-cost ratio
CES	-	Constant elasticity of substitution
CITES	-	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CM	-	Choice model
CV	-	Compensating variation
CVM	-	Contingent valuation method
DCA	-	Drug Control Authority
EIA	-	Environmental Impact Assessment
EV	-	Equivalent variation
FRA	-	Forest recreation areas
FRIM	-	Forest Research Institute Malaysia
GAWP	-	Grandfather Mountain Wilderness Preserve
GDP/GNP	-	Gross domestic products/Gross national products
GMP	-	Good manufacturing practice
GSP	-	Good storage practice
HCDC	-	Hicksian compensated demand curve
IRR	-	Internal rate of return
MAP	-	Malaysia Agricultural Park

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MIG	-	MIGHT Interest Group
MPP	-	Marginal physical products
MRTS	-	Marginal rate of technical substitution
MUM	-	Marginal utility of money/income
NDP/NNP	-	Net domestic products/Net national products
NFI	-	National Forest Inventory
NIA	-	National income accounts
NPCB	-	National Pharmaceutical Control Bureau
NPV	-	Net present value
NRA	-	National resource accounting
NTFPs	-	Non-timber forest products
NTFR	-	Non-timber forest resources
OLS	-	Ordinary Least Square
PURBATAMA	-	Persatuan Perubatan Tradisional Melayu Malaysia
SFM	-	Sustainable forest management
SNA	-	System of national accounts
TCM	-	Travel cost method
TEV	-	Total economic value
TNB	-	Total net benefits
TPP	-	Total physical product
TVC	-	Total variable costs
TVP	-	Total value products
VMP	-	Value of marginal products

WHO	-	World Health Organisation
WTA	-	Willingness-to-accept
WTP	-	Willingness-to-pay

CHAPTER 1

INTRODUCTION

1.1 General Background

The practice of using medicinal plants in Malaysia started a long time ago and has been widespread among the local rural communities, especially the Malays, aborigines and others. The utilization of these natural resources could be classified according to the three main races and four sources (Latiff 1989, Salleh 1998), namely Malay village medicine (including Orang Asli medicine), Chinese medicine (introduced from China), Indian medicine (introduced from India) and other traditional medicines (including those introduced by Javanese, Sumatrans, Arabs, Persians, Europeans, etc.). Although medicinal plants have been known throughout the world, public awareness is still lacking among the younger people. The rapid population increase along with the increase in education has improved the awareness of people towards the need for better health.

There are certain products derived from medicinal plants that are of economic value and have been traded for a long time in Malaysia. Among these are *Eurycoma longifolia* (tongkat ali), *Areca catechu* (pinang), *Oldenlandia diffusa* (siku-siku), *Myristica fragrans* (buah pala), *Piper nigrum* (black pepper) and *Melastoma decemfidum* (sesenduk putih) (Poh 1994). Although it is known that the products are well demanded locally, information related to resource supply and availability, trade practice, price,

cost, utilization, consumption pattern and so forth is still lacking. Therefore this study attempts to provide estimated economic values of Malaysian medicinal plants and also contribute towards better management of the resources since these plants, as well as timber trees, need good sustainable management for conservation. This is particularly vital in the case of those species facing the threat of extinction due to overexploitation and other reasons.

1.2 Problem Statement

Recently, Malaysia is striving to become an industrialized country through its vision 2020. The rapid expansion in the Malaysian economy over the last 5 years at an average annual rate of 7.1% since 1999 is mainly attributed to the effective management of the country's natural resources such as petroleum and forestry and man-made resources such as political stabilization and labour utilization. With the rapid expansion of economic growth, the government faced the task of steering the economy towards the path of achieving more sustainable growth while maintaining the environment and the society. Therefore it is a need to have a tool or measurement that can provide information to guide policy makers on making the best policy on the environment for country's benefits.

Definitions of sustainable development abound (Pearce et al. 1989, Jacobs 1993, Pearce & Warford 1993). The most widely promulgated definition of sustainable development is that given by the World Commission on Environment and Development; development is sustainable if it satisfies present needs without compromising the ability of future

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generations to meet their own needs (WCED 1987). Economic definitions of sustainable development have also focused on optimal resource management by concentrating on maximizing the net benefits of economic development subject to maintaining the services and quality of natural resources. The economic systems should be managed so that people could live off the dividend of their resources, maintaining and improving the asset base. Sustainable development is economic development that does not degrade the equality of the environment or the world's natural resource base that sustains human progress continuously (WRI 1992).

Generally, the national income and products accounts are the principal measures of aggregate economic activity. They were developed before the current attention to sustainable development and were not designed to measure economic-environmental interactions. They are however widely used not only as a measure of economic activity but as a measure of economic performance and in a loose sense economic welfare. The relevant question is whether and how national income and product accounts can be revised to better capture economic-environmental interactions and thus contribute to sustainable development policies. A full set of national accounts basically includes asset accounts which measure stocks and changes in stocks and flow accounts which measure output and income in an accounting period. These are gross domestic product (GDP), net domestic product (NDP), net national product (NNP) and national income.

Changes in stocks of natural resources have typically not been included in system of national account (SNA) (Dasgupta et al. 1995, Pearson 2000). As many of these resources generate essential life supporting services, their exclusion may severely distort

the net national product estimates. It should be of highest priority to try to include changes in the complete asset base in the accounts.

According to Pearce and Warford (1993), two major steps must be taken to capture the meaning of sustainable development:

a) Changing the national accounting system

Any environmental damage that occurs should be valued and deducted from GNP. A feasible first step would be to publish a separate set of resource accounts that show in nonmonetary units just what is happening to the resources in a given country. Such accounts exist in France and Norway (Dasgupta et al. 1995). More modest modifications can be made to sets of environmental statistics published in most industrial and developing countries. These accounts should show how changes in environmental variables are linked to changes in the economy. This at least avoids the error of managing the economy as if it were not related to environment. An alternative way to maintain a monitoring program designed to check on the sustainability of development is to keep track of changes in the physical measures of the stock and flow of resources.

b) Correcting prices

Ascribing the right economic value to natural resources is vital. The price of a natural resource should reflect its full value. That price is obviously linked to the cost of extracting or harvesting it. The market mechanism will ensure that these costs are reflected in the price, but extraction and harvesting can impose other costs as well. Prices should reflect not only the extraction and harvesting costs but also the