STUMPAGE VALUATION AND DENSITY OF VIRGIN JUNGLE RESERVE AT SUNGAI LALANG AND ULU GOMBAK FORESTS, MALAYSIA

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STUMPAGE VALUATION AND DENSITY OF VIRGIN JUNGLE RESERVE AT SUNGAI LALANG AND ULU GOMBAK FORESTS, MALAYSIA

By

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Malaysian forests are familiar for their diversity in flora and fauna species which have economic value. The most significant factor that contribute to the increase in economic values in a forest area is its timber resources. The total areas of jungle reserves in this state is 241,568.2 hectares, or 30.5% from total state forest. Diversification of sources of high value timber in the forest reserve will invite the intrusion of illegal loggers, which will have negative impacts on the ecosystem. Thus, a study was conducted in Virgin Jungle Reserve at Sungai Lalang forest in Compartment 24 (C.24) and Ulu Gombak forest in Compartment 23 (C.23) in Selangor. The study objectives were to identify the composition of trees, to estimate the stumpage value based on the current market value, and to estimate the total stumpage value in the forest catchment areas. Data was collected by counting every tree with a diameter more than 10 cm as sample data. Estimated stumpage values were measured by calculating timber values based on current market price which is different for each species. 418 trees with 224 species, 130 genus and 50 families per hectare in C.24 were enumerated. The most abundant species in C.24 was *Elateriopermum tapos*, while the largest families included *Euphorbiaceae*, *Dipterocarpaceae* and *Lauraceae*. The stumpage value of tree species diversity in this compartment was RM 194,520.70 per hectare. Meanwhile, 402 trees with 190 species, 108 genus and 46 families per hectare were enumerated in C.23. The most abundant species was *Aidia densiflora* while the largest families were *Euphorbiaceae*, *Rubiaceae* and *Lauraceae*. The stumpage value of tree species diversity in this compartment was RM 147,360.00 per hectare. Selangor's policy that has put a stop in issuing logging licenses in 2009 is seen as bringing positive impacts, whereby the study findings have seen an increase in species value, biological diversity and stumpage value in both study areas compared to previous studies.

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

PENILAIAN STUMPEJ DAN ISIPADU HUTAN SIMPANAN DARA DI HUTAN SUNGAI LALANG DAN ULU GOMBAK, MALAYSIA

Oleh

HARDIANSHAH BIN ISMAIL

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Hutan di Malaysia terkenal dengan kepelbagaian sumber spesies flora dan fauna yang mempunyai nilai ekonomi. Aspek terpenting yang menyumbang kepada peningkatan nilai ekonomi sesebuah kawasan hutan ialah sumber kayu kayannya. Kawasan hutan simpan di Selangor berjumlah 241,568.2 hektar, atau 30.5% daripada jumlah keseluruhan hutan negeri. Kepelbagaian sumber kayu kayan yang bernilai tinggi di dalam hutan simpan ini akan mengundang kepada aktiviti pencerobohan daripada pembalak haram yang akan memberikan kesan negatif kepada ekosistem. Sehubungan itu, kajian telah dijalankan di dua kawasan hutan simpan dara iaitu Hutan Sungai Lalang di Kompartment 24 (C.24) dan Hutan Ulu Gombak di Kompartment 23 (C.23) di Selangor. Objektif kajian ialah untuk mengenalpasti kepelbagaian spesies pokok, menganggar nilai ekonominya berdasarkan harga pasaran semasa dengan mengira nilai stumpej dan menganggar jumlah keseluruhan nilai stumpej di seluruh kawasan hutan. Pengumpulan data dilakukan dengan mengira setiap pokok yang berdiameter 10 cm ke atas sebagai sampel. Anggaran nilai stumpej pula diukur dengan melihat nilai pokok yang dikira menggunakan harga pasaran pokok semasa yang berbeza antara setiap spesies. Terdapat 418 pokok dengan 224 species, 130 genus dan 50 famili per hektar di C.24. Spesies yang paling banyak didapati di C.24 adalah *Elateriopermum tapos* sementara famili yang paling besar pula termasuklah *Euphorbiaceae, Dipterocarpaceae* dan *Lauraceae*. Nilai stumpej kepelbagaian pokok di C.24 adalah RM 194,520.70 per hektar. Manakala, terdapat 402 pokok dengan 190 species, 108 genus dan 46 famili per hektar di C.23. Spesies yang paling banyak didapati adalah *Aidia densiflora* sementara famili yang paling besar adalah *Euphorbiaceae, Rubiaceae* dan *Lauraceae.* Nilai stumpej kepelbagaian pokok di C.23 adalah RM 147,360.00 per hektar. Polisi negeri Selangor yang menghentikan pemberian lesen pembalakan pada tahun 2009 ini juga dilihat memberi impak positif dimana hasil kajian mendapati berlakunya peningkatan nilai spesies, kepelbagaian diversiti dan juga nilai stumpej di kedua-dua kawasan kajian berbanding kajian-kajian yang dijalankan sebelum ini.

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I certify that a Thesis Examination Committee has met on 29 November 2016 to conduct the final examination of Hardianshah bin Ismail on his thesis entitled "Stumpage Valuation and Density of Virgin Jungle Reserve at Sungai Lalang and Ulu Gombak Forests, Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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LIST OF ABBREVIATIONS

C.23	Compartment 23
C.24	Compartment 24
Cm	Centimeter
DBH	Diameter at Breast HeighT
GDP	Gross Domestic Product :
ha	Hectare
ICT	Communication and Information Technology
INTROP	Institute of Tropical Forestry & Forest Products
m	Meter
MOSTI	Ministry of Science, Technology and Innovation
MTC	Malaysia Timber Council
MTIB	Malaysian Timber Industry Board
MUS	Malayan Uniform System
PVC	Polyvinyl chloride
RM	Ringgit Malaysia
SMS	Selective Management System
SSFD	Selangor State Forestry Department
WWF	World Wide Fund

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Selangor, like other Malaysian states, enjoys abundant forest resources. In Malaysia, forested areas provide economic values that provide numerous benefits to humans that include use values[1] such as tourism and recreation, conservation, agriculture, fisheries, timber, non-timber forest products and non-use values[2] such as watershed protection, fisheries, tourism, shoreline protection, biodiversity (Bidin & Latiff, 1995). The potential of forests for resource extraction is precisely why they must be protected. Therefore, the Selangor State Forestry Department (SSFD) has become concerned about the preservation and conservation of forest resources in the state.

As one of the agencies that develops, maintains, and administers the state's forests, SSFD (2009) employs approaches which include maintaining the existing Permanent Forest Reserve and its magnitude, managing the production, conservation and protection of class-based forest use, implementing the Intensive Forest Management Plan, and creating communication and information technology (ICT) within the current forestry to enhance the contribution of the forestry sector to the socioeconomic development of the state.

SSFD also implements criteria, indicators, activities, and Standards Implementation of Sustainable Forest Management (MC & I) and MS ISO 9002, enforces jungle laws in an efficient and effective manners through monitoring, surveillance and prosecution, develops master plans for the state parks and forests as well as promoting them as a tourist destination. Also, the agency uses environmental-friendly technology in the harvesting and utilization of forest residues and other plants to encourage downstream processing of forest products. The agency also encourages and supports agro-forestry programs and urban forestry, implements human resource development programs, and provides adequate infrastructure facilities.

There are several methods which may be used to compute the economic value of a particular forest, by taking into account the various sources that make up its composition. One of the methods is by calculating its stumpage value. This study focused on the estimation of the value of standing trees for 1-hectare (ha) areas, based on the current timber costs (MTIB, 2012). The findings of the study used to estimate the

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[1]Use values describe the productive or consumptive values of the forest components or functions (International Institute for Environment and Development (IIED), 1994)

[2]Non-use values are the value of environmental functions that support or protect an economic activity (IIED, 1994)

economic value of two forests, namely Sungai Lalang forest and Ulu Gombak forest, with an area of 17.099.77 ha and 16867.49 ha, respectively. This will also contribute to

the improvement of policies regarding management of forest areas. In fact, National Forest Policy serves as the foundation of sustainable forest development. The need for new measures is imperative to improve along with the changing times.

1.1.1 Selangor's Forest

The Selangor State Forestry Department (SSFD, 2010) covers Selangor, one of the states located in the western Peninsular Malaysia, and has a forest area which amounts to 791,084 ha. A total of 5,102.6 million people in the state work in various economic fields such as service, manufacturing, construction, agriculture, mining, and quarrying. Out of 791,084 ha of the state forest, there were 241,568.30 ha, including 59 reserved forests (Table 1).

Table 1: Class of reserved forest in Selangor

No	No. of Reserved Forest	Class of Forest	Width (ha)
1	32	Natural Inland Forest	142, 021.00
2	4	Peat Swamp Forest	81 458.50
3	23	Mangrove Forest	18, 088.80

(Source: SSFD, 2010)

Permanent forest reserves in Selangor have existed since 1898. Types of permanent forest reserves in Selangor forest are as follows (Table 2):

Table 2: The fraction of permanent forest reserve in Selangor

No	Category of forest	Area (Ha)	Percent (%)
1	Production	77,299	32.00
2	Protection	164,277	68.00

(Source: SSFD, 2010)

Permanent forest reserves can be divided into three types: natural forest, which is forest land (32 areas); peat swamp forests (4 areas); and mangroves (23 areas), respectively totaling 142,021 ha, 81,458.50 ha and 18,088.80 ha. Selangor's state forests are also divided into eleven functional classes (Table 3).

Table 3: Eleven functional classes for Selangor's state forest

No	Classes	Hectare (ha)
1	Timber Production Forest under Sustained Yield	72,546.00
2	Forest Protection	27,916.00
3	Forest Reclamation	0
4	Flood Control Forest	0
5	Virgin Jungle Reserved (VJR)	2,416.00
6	Water Catchment Area	44,543.00

7	Forest Park	14,601.00
8	Education Forest	1,435.00
9	Research Forest	9,643.00
10	Federal Purpose's Forest	817.00
11	Wildlife Protection Forest	14,360.00

(Source: SSFD, 2009)

Forest areas have many functions which are profitable, especially in situations in which flora and fauna are needed. For example, some forest areas have also become a place for recreational activities, especially for the eco-tourism sector. Forests known as 'forest parks' (Table 4) have sustained contributions for by fulfilling demand for recreational activities.

Table 4: Number of the State Forest Park

No	Forest Park Name	Year Established
1	Sungai Tekala Forest Park	1982
2	Sungai Tua Forest Park	1993
3	Gunung Nuang Forest Park	1996
4	Sungai Sendat Forest Park	1991
5	Commonwealth Forest Park	1992
6	Rimba Ampang Forest Park	1983
7	Kanching Forest Park	1987
8	Chongkak Forest Park	1992
9	Templer Forest Park	1996

(Source: SSFD, 2010)

At the end of 2009, there were 12 virgin jungle reserved forests in Selangor covering approximately 22,778 ha as follows (Table 5):

Table 5: The area of Virgin Jungle Reserve (VJR) in Selangor

No	Reserve Forest	No. Compartment	Established	Width (Hectare)
1	Sungai Lalang	89	1959	189
2	Ulu Gombak	22 & 23	1959	405
3	Semangko	30	1916	28
4	Sungai Lalang	24	1970	82
5	Bukit Cherakah	14	-	200
6	KualaLangat Selatan	26	1927	174
7	Hulu Langat	64	1969	340
8	Pulau Kelang	13	1994	417
9	Hulu Langat	81D	1914	154
10	Bukit Tarek	13B	-	76

11	Bukit Lagong	15	1947	65
12	Bukit Jugra	-	1904	148

(Source: SSFD, 2009)

1.1.2 Malaysia's Timber Industry

One of the important parts of a forest is timber. The existing timber in a forest area has a variety of uses, particularly for the production of furniture and homes. Based on Malaysian Timber Industry Board reports (MITB, 2009), there are more than 20 types of forest timber available in Malaysia. Some examples are *Chengal, Balau, Red Balau, Merbau, Keruing, Kempas*, and *Tualang*. Each type of timber has different prices according to its category: hardwood heavy, medium, or light hardwood (MTIB, 2012). The three principal categories differ in terms of hardness.

These differences affect the quality of products for all three categories of timber. Hard timber is high in quality, so products are durable and not as fast to decay or become damaged. It is quite different from the category of low-quality timber. The difference eventually has caused the price of each type of timber to differ. Below are the examples of timber products based on regional exports in 2009 (Table 6):

Table 6: Malaysia; regional export of major timber products, 2009

Products	**2009**			
	Peninsular Malaysia	**Sabah**	**Sarawak**	**Total**
	(RM'000)	(RM'000)	(RM'000)	(RM'000)
Logs	5,076	269,054	1,647,063	2,021,066
Sawn timber	989,063	651,474	704,874	2,345,411
Sleepers	11,966	46	3060	15072
Plywood	336,024	1,237,421	3,413,893	4,987,338
Veneer	11,116	105,868	190,599	307,583
Moldings	427,990	206,441	51,979	686,410
Chipboard/ Particleboard	187,292	11,800	51,057	250,149
Fiberboard	818,585	0	214,850	1,033,435
Wooden Frame	105,202	2	0	105,204
Builders' Joinery & Carpentry	776,464	65,753	145,571	987,788
Wooden Furniture	6,172,627	47,985	27,606	6,248,218
Rattan Furniture	23,585	6,051	0	29,636
Other Timber Products	355,554	32,094	86,559	474,207
Total	**10,220,545**	**2,633,990**	**6,636,984**	**19,491,518**

(Source: MTIB, 2009)

Based on reports from the Malaysian Timber Council (MTC, 2007), Malaysia has long been a leading producer of tropical hardwood products. The resistant Malaysian timber industry contributed no less than 4% to gross domestic product (GDP) in 2005; in 2010, the revenue for the timber in Peninsular Malaysia alone reached RM 61.4 million (FDPM, 2010). However, lately the timber production from natural forests in Malaysia has decreased. This is because the sustainability of forest management has increased due to law enforcement and the tightening of policies and regulations, especially for deforestation activities.

The change in laws regarding deforestation was primarily due to the main objectives of Forest's Policy, namely to conserve and manage forests based on sustainable forest management and protects the environment, preserve biodiversity, and provide space diversity for both research and educational activities (SSFD, 2009). This also ensures that a forest resource sustainably allows continuous production of forest goods and services and their optimum exploitation, while remaining friendly to environmental requirements.

1.2 Problem Statement

The data from SSFD's annual report (2009) showed that in 2009, the total area of forest reserves in Selangor was 241,568.2 ha, or 30.5% of state land. From that, there are 59 permanent forest reserves which were divided into the following three categories: 32 protection forest reserves under natural land forests, 4 protection forest reserves for peat swamp forests and lastly, protection forest reserves under mangrove forests.

Generally, forest management in Selangor is divided into three main forest districts, namely Hulu Selangor, Selangor Tengah, and Pantai Klang. These areas represent forest reserves. In 2009, the total area of Permanent Forest reserved in Selangor was 241,568.2 ha, or 30.5% of total state lands; this included production forests, which make up 77,290 ha at 32% and protection forest 164, 277 ha at 68%.

Forestry essentially contributes towards eco-tourisms sector especially with the impact of the economic development based on Vision 2020, which is to ensure sustainable development in Malaysia and raise awareness among Malaysians to care for the environment. Recreational forests not only contribute to eco-tourism for tourists, but also accommodate those who would like to relax and enjoy nature. In 2009, The Forestry Department of Selangor has allocated RM 722,483.00 to facilitate and manage recreational forest's infrastructures. There are nine recreational forests in Selangor, including Sungai Tekala's recreational forest, Sungai Tua's recreational forest, Gunung Nuang's recreational forest, Sungai Sendat's recreational forest, Tanaman Rimba Komenwel, Rimba Ampang's recreational forest, Kanching's recreational forest, Chongkak's recreational forest, and finally Templer's recreational forest.

In addition, Forest Reserves or protect forests are considered part of a permanent forest reserve in Malaysia. These forests contribute towards the total of Malaysia's forest cover

and are occasionally considered Production Forests, as logging licenses can be issued over such forests. In some forests, logging raises the possibility that these forests are being counted within total forest size. Thus, the truly protected areas should be termed 'Totally Protected Areas' which in fact only refers to forests gazetted as *National Parks*, *Wildlife Sanctuaries*, *Nature Reserves*, or *Virgin Jungle Reserves*. Such forests have been designated conservation and recreational parks, restricted research, education zones, and representative forests.

Timber is a forestry resource contributing to the economy of Malaysia. There are many products, especially furniture that use timber as their main element such as chairs, tables, cabinet, cupboard, houses, and so on. This has led to an increase in the price of the timber each year. Based on MITB's (2009) report, from 2007 to 2009, Malaysia's export of timber product in peninsular Malaysia reached RM 33,732,825, Sabah's state RM 9,203,920, Sarawak's state RM 22,111,034 and the total of export timber products for 3 years was RM 65,047,786 (Table 7). The products that Malaysia exports not only consist of wooden furniture, but also logs, sawn timber, plywood, veneer, moldings, chipboard/particleboard, fiberboard, wooden frame, builders' joinery, carpentry rattan furniture and so on.

Table 7: Malaysia; regional export of timber products, 2007-2009 (RM)

Region	2007	2008	2009	Total
Peninsular Malaysia	11,702,443	11,809,837	10,220,545	33,732,852
Sabah	3,546,635	3,023,303	2,633,989	9,203,92
Sarawak	7,515,213	7,958,837	6,636,984	22,111,034
Total	22,764,291	22,791,977	19,491,518	65,047,786

There are 11 types of logs that Malaysia exports, including *Balau, Red Meranti, Kapur, Keruing, Light Red Meranti, Damar Minyak, Araucaria, Resak, Acacia Mangium, Belian* and so on. From 2007 until 2009, the total of logs was estimated to be 13,160 ($000m^3$) or RM 6,189,628 (MITB, 2009). On the other hand, Malaysia's imports of timber products from 2007 to 2009 totaled RM 7,665,534,911 (MITB, 2009). Malaysia has to import timber products because of a lack of resources, such as logs from major species that are not available in Malaysian forests, the tree including *Oak, Beech, Meranti Bakau, Belian, Red Balau*, Hill Species*, Balau, Eucalyptus, Sesendok, Simpoh* and so on.

However, activities such as logging, deforestation, land clearing for agriculture, residential and industrial construction, infra-structural development and accommodating the import and export of timber products for Malaysia and the international market has negative impacts such as:

1. Harvesting of timber and non-timber forest products;
2. Loss or change of habitats; and
3. Harm to habitats and ecosystems through pollution.

These impacts will affect the economic value of forests, especially in Selangor. In order to improve the sustainability of forest, this study will analyze the economic value of stumpage selected catchment areas in Selangor and propose solutions to improve forest management policy. The study provides research questions to state clearly what this study investigates or attempts to prove, namely the value in Malaysian Ringgit of stumpage in the selected catchment areas in Selangor? What are the effects of activities in forest areas in terms of economic value? How should one calculate the economic value of stumpage in forestry?

1.3 Objectives of Study

The general objective of this study is to estimate the economic value based on stumpage at Sungai Lalang and Ulu Gombak's Forestry. The specific objectives are as follows:

(1) To identify the composition of trees in the forest catchment area at Sungai Lalang and Ulu Gombak;
(2) To estimate the stumpage value based on the current market value; and
(3) To estimate the total of stumpage value in Sungai Lalang and Ulu Gombak forests.

1.4 Significance of Study

Forestry is infinitely valuable especially in economic processes and it is depending of their forest resources. From the finding of this study, we can calculate the economic value in the study area. This is important to ensure that the sustainability of the forest will be reserved for the next generations.

Estimation of stumpage value is not new; previous studies have a lot of data on the stumpage value of the forested catchment areas which are rich with flora and fauna. Such studies are very important to provide the impression of the consequence of forests area to the public. It is important to the ruling party, especially to ensure that forest management areas rich with biodiversity may be maintained. Due that, this forest catchment area will be used as the district for the purpose of protection.

The implementation of policy related to the management and protection of the forests in Malaysia is closely related to the value of forests to the public. For example, forests in Selangor can be divided into eleven categories, including the water catchment area, forest park, education forest, research forest, federal purpose forest, and wildlife protection forest (Refer Table 3). Realizing the presence of weaknesses and the need to enhance development of forest area, there have been challenges to improve policymaking and existing policy in order to ensure the management system of forest areas will be organized effectively. As we know, forest catchment areas in Malaysia are rich with bio diverse flora and fauna. If these areas which have many resources are not well protected, after 5 or 10 years they will lose their value.

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