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Economic Valuation of Medicinal Plants in Ayer Hitam Forest Reserve (AHFR), Puchong, Selangor Darul Ehsan

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ABSTRACT

The importance of forests has long been associated with timber rather than non-timber forest produce (NTFP) and environmental services (ESs). The interest in assigning values to these NTFP and ESs, such as medicinal plants, biodiversity protection, carbon sequestration and storage services, has increased since it was realized that forests also serve other functions that are equally important to be explored. Ayer Hitam Forest Reserve (AHFR) in Puchong, Selangor, is known to have all the treasured heritage of a rich forest. Nevertheless, due to its strategic location in combination with the current pressure for socio-economic development, the possibility of AHFR being converted into some other uses cannot be ruled out. Every effort must be made to quantify the treasures of AHFR as a centre for research and education, as well as a provider of other environmental services. To date, various scientific studies have been conducted in AHFR, including economic valuation of its timber and identification of its flora and fauna. The identification of the flora, especially medicinal plants, thus far has not involved any form of economic valuation. Results showed that the estimated total economic value of medicinal plants ranged from a low of RM67,192 to a high of RM254,255. The medicinal plant species commonly found in AHFR include tongkat ali (Eurycoma longifolia), *kacip fatimah* (Labisia pumila) *and tongkat hj. samad* (Prismatomeris *sp.*).

INTRODUCTION

Valuation of non-timber forest produce (NTFP) and environmental services (ESs) became a major interest when it was discovered that timber could no longer provide the needed revenue for continuous economic development. This is especially true for certain countries in which a majority of their coffers come from forest revenues. Put simply, to depend on timber as a sole source of revenue from the forest in the long run may no longer be a wise decision since the resource itself is getting scarcer due to increasing public demands. In order to ensure continuous economic growth, every effort must be made to seek other forms of revenue from the forest, in this case NTFP and ESs. The call to place more emphasis on not only timber but also NTFP and ESs in Malaysia has emerged with the full endorsement from the National Forest Policy (NFP) in 1978 (revised in 1992). With its main principle being sustainable management of forest resources, either the timber or NTFP and ESs, the NFP's endorsement also indirectly indicates the commitment of the Government of Malaysia (GoM) in ensuring that the protection of the environment and conservation of her rich and diverse forest resources persist over time.

Since 1978, the importance of NTFP and ESs has started to gain ground locally. Also, from that date onward, economic valuation of NTFP and ESs, such as medicinal plants and fruits, watershed protection, air-pollution reduction/abatement, biodiversity, culture, heritage and other non-use values, has gained popularity. Local empirical research on these NTFP and ESs includes studies by Woon *et al.* (1996) on petai *(Parkia speciosa)*, Norini and Mohd Azmi (2001) on the market value of tongkat ali (*Eurycoma longifolia*), Kumari *et al.* (1996) on the trade of medicinal plants in Peninsular Malaysia, Mohd Shahwahid *et al.* (1996) on the value of watershed protection versus timber production in Hulu Langat Forest Reserve (HLFR), and Kenneth *et al.* (1996) on consumer demand for forest recreation in Peninsular Malaysia.

About Ayer Hitam Forest Reserve (AHFR), Awang Noor *et al.* (1999) discussed selected economic values of the said forest reserve, such as those of timber, recreational opportunities, benefits to the local community, and wildlife resources. Timber value was estimated using the stumpage value approach, while the value of recreational benefits of AHFR was determined using the zonal travel cost method (Mohd Shahwahid *et al.*, 1998). The main objective of the study was to calculate the net social benefit by estimating the demand function of recreational opportunities of AHFR. The difficulty of attaching economic values to these NTFP and ESs is another major reason why these resources usually lose out to other land-use competitors. Above all, full recognition of NTFP and ESs does not stop with valuation but also involves disseminating these values to policy-makers. Various techniques are available for valuation of timber, NTFP and ESs, such as (a) market price or cost-based methods, (b) surrogate market methods and (c) constructed market or contingent methods (Bishop, 1996). Regardless of the technique used, the main reason for such evaluation is to indicate the increasing importance placed on NTFP and ESs in serving the well-being of the Malaysian society (Table 1). Other empirical studies carried out on AFHR focused on weedy plants, fruit trees, small mammals, mosses and herbaceous plants. Of the studies conducted so far, none has focused on giving economic value to medicinal plants found in AHFR.

The current socio-economic pressure for development, coupled with its strategic location, does not rule out the possibility of AHFR being opened up for other land development. Therefore, this paper aims at quantifying the medicinal plants available in AHFR and giving economic values to the said resources. It is hoped that such valuations will help boost the true economic value of AHFR.

MATERIALS AND METHODS

Basically, there are two main steps involved in quantifying and giving economic value to medicinal plants found in AHFR. First is an inventory of medicinal plants based on accessible compartments selected at random. Second is

TABLE 1
Evaluation techniques for market and non-market values in forestry

	Use values			Non-use values
VALUES	1. Direct	2. Indirect	3. Option	4. Existence
	Wood products (timber, fuel)	Watershed protection	Future uses as per 1 & 2	Biodiversity
		Nutrient cycling		Culture, heritage
	Non-wood products (food, medicine, genetic material)	Air pollution reduction		Intrinsic worth
		Microclimatic regulation		
	Educational, recreational & cultural uses	Carbon store		
	Human habitat			
	Amenities			
TECHNIQUES	Market prices and analysis	Production function	Contingent valuation	Contingent valuation
	Related goods & approaches	Preventive expenditures		
	Contingent valuation	Replacement costs		
	Hedonic price			
	Replacement costs			

Source: Bishop (1996)

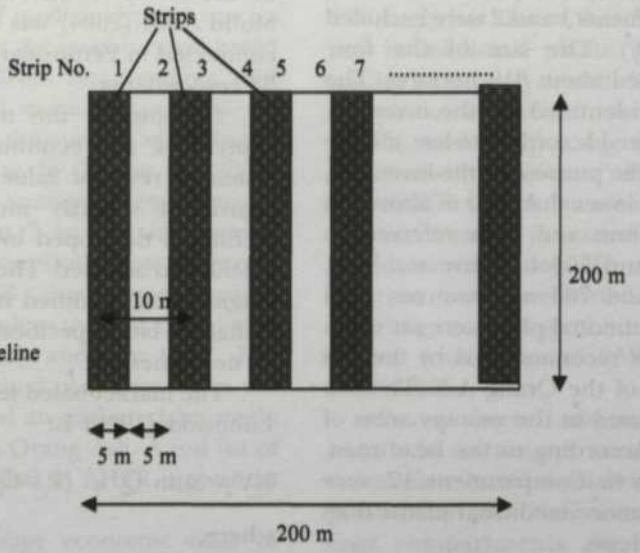
the computation of the economic value based on a survey of medicinal plants collectors carried out by Mohd Azmi in 2004. Two separate techniques were used in conducting the inventory, namely, the techniques popularized by Awang Noor and Mohd Shahwahid (1995) and Norini and Mohd Azmi (2001).

Inventory Based on the Strip-Line Approach

The technique improvised by Awang Noor and Mohd Shahwahid (1995) involved setting up an inventory block measuring 200 m by 200 m (*Fig. 1*). The inventory block was further divided into 40 strips measuring 5 m by 200 m. For the purpose of this inventory, only alternate strips were fully inventoried. This included measuring all medicinal plants of height 1 foot and above.

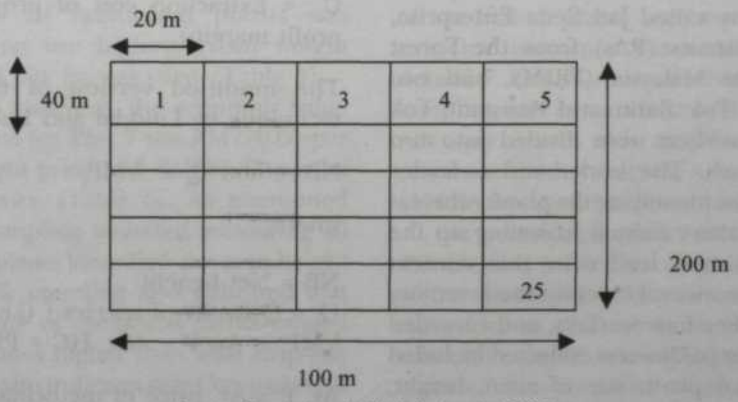
Inventory Based on the Sub-blocks Approach

On the basis of an earlier inventory technique developed by Awang Noor and Mohd Shahwahid (1995), Norini and Mohd Azmi (2001) further modified the size of the main inventory block into a 200 m by 100 m block (*Fig. 2*). The main inventory block was further divided into another 25 sub-blocks measuring 20 m by 40 m each. Using a slightly different approach, Norini and Mohd Azmi (2001) suggested that all medicinal plants in the 25 sub-blocks should be inventoried. The main inventory block was divided into sub-



Source: Awang Noor and Mohd Shahwahid (1995)

Fig. 1: An inventory block measuring 200 m by 200 m



Source: Norini and Mohd Azmi (2001)

Fig. 2: An inventory block measuring 100 m by 200 m

blocks for better monitoring of the data-collection process. Hence, once the inventory of a compartment was completed, the medicinal plants that were recorded could easily be cross-checked with a few plots chosen at random. The setting up of a sample plot was in line with the direction of the compartment, i.e. facing north.

Selection of Areas to be Inventoried

To be able to get a good indication of the availability of medicinal plant resources in AHFR, the selection of areas to be inventoried should have covered all compartments. However, because of budget constraints and problems of accessibility, only four of the six compartments were inventoried, namely Compartments 12, 13, 14 and 15 (Compartments 1 and 2 were excluded from the inventory). The size of the four compartments totalled about 919 hectares. The four compartments identified for the inventory were further categorized according to low, middle and high lands. For the purpose of the inventory, low referred to land lower than 400 m above sea level, whereas medium and high referred to land between 400 and 500 m above sea level, and between 500 and 700 m above sea level respectively. Two additional plots were set up in Compartment 12, as recommended by the *Tok Batin* or head man of the Orang Asli. The two extra plots were located in the swampy areas of the forest reserve. According to the head man, these swampy areas in Compartment 12 were believed to contain more medicinal plants than the other compartments.

The Inventory Group

The inventory was carried out by 10 workers (i.e. 1 leader, 1 co-leader and 8 field workers) from a private company called Jati Sena Enterprise, two research assistants (RAs) from the Forest Research Institute Malaysia (FRIM), and two Orang Asli (i.e. Tok Batin and Assistant Tok Batin). The 10 workers were divided into two groups of five each. The leader and co-leader were responsible for identifying the plants, whereas the other two workers assisted in setting up the plots. The appointed leader in this context conducted the inventory, i.e. set up the inventory block with the other four workers, and recorded all of the data. The parameters collected included types of medicinal plant, size of stem, height, crown width and other related information (Appendix 1). The Tok Batin, Assistant Tok Batin, and the two RAs were responsible for identifying the medicinal plants. Three perspectives, namely botanical, local and Orang Asli names, were noted. All in all, the inventory took about a month to complete.

Valuation of Medicinal Plants

In the preceding paragraphs, the two inventory techniques used in the study were explained. The next crucial step was to translate the quantity of medicinal plants collected into value. To be able to estimate the value of medicinal plants, information on average price per kilogram, average harvesting cost, and profit margin had to be made available. For this study, information on the survey of collectors conducted earlier by Mohd Azmi (2004) was utilized. The survey was conducted in Peninsular Malaysia with a total of 33 respondents.

To estimate the net benefit, which also represents the economic standing stock or potential residual value of the said medicinal plants, a slightly modified market-based technique developed by Linddal and Luboswki (1999) was adopted. The difference between the original and modified market-based techniques is that the latter specifically details the calculation of net benefit.

The market-based technique by Linddal and Luboswki (1999) is:

$$NV = \text{Sum } Q_i \times (P_i - C_i)$$

where,

NV = Net value
Q_i = Quantity of product i
P_i = Price of product i
C_i = Extraction cost of product i (including profit margin)

The modified version of the market-based technique by Linddal and Luboswki (1999) is:

$$NB = \text{Sum } Q_i \times VMP_i$$

where,

NB = Net benefit
Q_i = Quantity of species i (i.e. stock)
VMP_i = Av. P - (Av. HC + PM)

Av. P = Av. price of medicinal plants per kg
HC is the average of harvesting cost
PM is the profit margin

VMP_i is actually the value of medicinal plant species per kg.

RESULTS AND DISCUSSION

Analysis indicated that there were no significant differences between the numbers of species identified based on location, i.e. low, medium and high lands. For instance, using strip-line sampling, 10 species were identified in Compartment 15 located on the low land, whereas another 10 and 7 species were identified in Compartments 13 and 15 located on the medium and high lands respectively (Table 2). In other words, the number of species identified did not vary much with regard to location above sea level.

Similar numbers of medicinal plant species also were observed when the inventory was based on a 100% sampling from low, medium and high lands (Table 3). A quick look at Tables 2 and 3 also indicates that the number of medicinal plant species seemed to be higher for those plots located in the swampy areas, namely Compartment 12 (Plots 7 and 8) inventoried using the two techniques. Both plots indicated more than 166 and 763 other species, besides the common species, such as tongkat ali, tongkat hj. samad, tapak sulaiman and akar lepar. The large number of medicinal plants found in the swampy areas confirmed an earlier claim made by the Tok Batin of the Orang Asli. A full list of medicinal plants identified in AHFR is given in Appendix 2.

The estimated average economic value of medicinal plants based on a strip-line inventory of all eight plots was RM26,556.80 (i.e. average green weight price per ha multiplied by 1,248 ha, the total size of AHFR). The highest estimated economic value of medicinal plants was RM96,894.72 when the highest green weight price of RM77.64 per ha was used (Table 4).

With a 100% sampling, the economic value of medicinal plants for Plot 7 was RM770.66 per ha for green weight price and RM385.33 per ha for dry weight price (Table 5). As mentioned earlier, a 100% sampling included measuring all of the medicinal plants identified down to height of 1 foot. A 100% sampling also indicated that the economic value of medicinal plants ranged from 3.5 to 1.3 times higher than with strip-line sampling. Table 5 also indicates that Compartment 12 seemed to have a higher value for medicinal plants of between RM46.85 per ha and RM770.66, per ha. This valuation implied that Compartment 12 is richer in medicinal plants than other compartments. The average economic value for medicinal plants, after excluding the two extreme values (RM1.83 per ha from Plot 2, Compartment 13, and RM770.66 per ha from Plot 7, Compartment 12), was estimated to be RM53.84 per ha. Therefore, with a total area of 1,248 ha, the total economic value of medicinal plants in AHFR was approximately RM67,192.32. A much higher total economic value of medicinal plants of RM254,255.00 was obtained when the higher economic green weight price of RM203.75 per ha was used.

CONCLUSION

The study has shown that AHFR is substantially rich in medicinal plants. The medicinal plant species commonly found, including tongkat ali (*Eurycoma longifolia*), kacip fatimah (*Labisia pumila*) and tongkat hj. samad (*Prismatomeris* sp.), and with addition of other species, indicated that AHFR is rich in resources. Analyses also indicated that the estimated total economic value based on six plots from four of the six compartments inventoried based on a 100% sampling, excluding the two extreme values, ranged from a low of RM67,192 to a high of RM254,255.

One of the two additional plots, i.e., Plot 7 located in the swampy area, had a much higher economic value of medicinal plants of RM770.66 per ha than the other seven plots found in the four compartments. In fact, the estimated economic value of Plot 8 (RM46.85 per ha), also located in the swampy area, was higher than that of the rest of the plots, except for Plot 4, Compartment 12 (Table 5). The economic value of medicinal plants was much lower when a strip-line inventory was used. Because of the detailed information derived from a 100% sampling and because the cost of inventory does not vary much with strip-line sampling, it is recommended that such a sampling technique (100%) be used for inventorying small plants.

As mentioned earlier and again stressed in this section, to be able to get a good indication of the availability of medicinal plant resources, the selection of areas to be inventoried should cover all compartments. Above all, the different types of location also need to be sufficiently replicated. Such an approach would not only be representative of the inventory results but also

TABLE 2

Inventory of medicinal plant species in Ayer Hitam Forest Reserve, Puchong (based on strip-line sampling)

Compartment	Plot	Location	No. of medicinal plant species identified	Common species identified	Botanical name	Local name	Name as quoted by Orang Asli
13	3	Medium	10	Tongkat hj. samad (2)	*Prismatomeris sp.*	Tongkat hj. samad	Tongkat hj. samad
				Tongkat ali (4)	*Eurycoma longifolia*	Tongkat ali	Pasak bumi
				Kembang semangkok (14)	*Scaphium affinis*	Jarak hutan, renung	Meluar
				Pecah kelambu (16)	*Cordyline fruticosa*	Pecah kelambu	Jejuang
				Others (57)			
12	4	Medium	12	Akar ipoh (9)	*Strychnos ovalifolia*	Akar ipoh	Ipoh malai
				Tongkat ali (3)	*Eurycoma longifolia*	Tongkat ali	Pasak bumi
				Kembang semangkok (7)	*Scaphium* ssp.	Jarak hutan, renung	Meluar
				Pecah kelambu (14)	*Cordyline fruticosa*	Pecah kelambu	Jejuang
				Others (22)			
12	7*	Low	16	Tongkat ali (2)	*Eurycoma longifolia*	Tongkat ali	Pasak bumi
				Tongkat hj. samad (6)	*Eugenia dyeriana*	Tongkat hj. samad	Tongkat hj.samad
				Tapak sulaiman (20)	*Elephantopus scaber*	Tapak sulaiman	Tapak badak
				Akar lepang (21)	*Bauhinia* ssp.	Akar lepang	Akar lepang
				Others (77)			

Note: "*" denotes swampy area.

TABLE 2 (Continued)

Compartment	Plot No.	Location	No. of medicinal plant species identified	Common species identified	Botanical name	Local name	Name as quoted by Orang Asli
15	1	Low	10	Tongkat ali (8)	*Eurycoma longifolia*	Tongkat ali	Pasak bumi
				Pokok ipoh (9)	*Strychnos ovalifolia*	Pokok ipoh	Ipoh balai
				Mempelas (9)	*Delima scandens*	Mempelas	Sepelas bulu
				Merian (7)	*Ardisia* ssp.	Merian	Merian kayu
				Others (24)			
15	5	High	7	Tongkat ali (11)		Tongkat ali	Pasak bumi
				Paku miding (14)		Paku miding	Paku seleleh
				Jelai (10)		Jelai	Paku lagu
				Pokok ipoh (8)		Pokok ipoh	Ipoh malai
				Others (14)			
12	2	Low	13	Tongkat ali (3)		Tongkat ali	Pasak bumi
				Kacip fatimah (7)		Kacip fatimah	Merian batu
				Tongkat haji samad (2)		Tongkat haji samad	Tongkat haji samad
				Kembang semangkok (27)		Kembang semangkok	Meluar
				Others (68)			
12	8*	Low	22	Tongkat ali (7)		Tongkat ali	Pasak bumi
				Tongkat haji samad (27)		Tongkat haji samad	Tongkat haji samad
				Tapak sulaiman (50)		Tapak sulaiman	Tapak badak
				Pecah kelambu (67)		Pecah kelambu	Jejuang
				Others (208)			
14	6	High	15	Tongkat ali (14)		Tongkat ali	Pasak bumi
				Tongkat haji samad (6)		Tongkat haji samad	Tongkat haji samad
				Kacip fatimah (16)		Kacip fatimah	Merian batu
				Pecah kelambu (34)		Pecah kelambu	Jejuang
				Others (120)			

Note: "*" denotes swampy area.

TABLE 3

Inventory of medicinal plant species in Ayer Hitam Forest Reserve, Puchong (based on 100% sampling)

Compartment	Plot No.	Location	No. of medicinal plant species identified	Common species identified	Botanical name	Local name	Name as quoted by the Orang Asli
13	3	Medium	20	Tongkat hj. samad (2)		Tongkat hj. samad	Tongkat hj. samad
				Tongkat ali (9)		Tongkat ali	Pasak bumi
				Kacip fatimah (3)		Kacip fatimah	Merian kayu
				Pecah kelambu (21)		Pecah kelambu	Jejuang
				Others (126)			
12	4	Medium	22	Tongkat hj. samad (5)		Tongkat hj. samad	Tongkat hj. samad
				Tongkat ali (11)		Tongkat ali	Pasak bumi
				Kembang semangkok (12)		Jarak hutan, renung	Meluar
				Pecah kelambu (21)		Pecah kelambu	Jejuang
				Others (117)			
12	7*	Low	19	Tongkat ali (6)		Tongkat ali	Pasak bumi
				Tongkat hj.samad (27)		Tongkat hj. samad	Tongkat hj. samad
				Tapak sulaiman (39)		Tapak sulaiman	Tapak badak
				Akar lepang (37)		Akar lepang	Akar lepang
				Others (166)			

Note: "*" denotes swampy area.

TABLE 3 (Continued)

Compartment	Plot No.	Location	No. of medicinal plant species identified	Common species identified	Botanical name	Local name	Name as quoted by Orang Asli
15	1	Low	15	Tongkat ali (8)		Tongkat ali	Pasak bumi
				Paku miding (52)		Paku miding	Paku seleleh
				Kacip fatimah (7)		Kacip fatimah	Merian batu
				Pokok ipoh (19)		Pokok ipoh	Ipoh malai
				Others (66)			
15	5	High	9	Tongkat ali (35)		Tongkat ali	Pasak bumi
				Merian (13)		MerianMerian kayu	
				Paku miding (11)		Paku miding	Paku seleleh
				Mempelas (7)		Mempelas	Sepelas bulu
				Others (11)			
12	2	Low	15	Tongkat ali (2)		Tongkat ali	Pasak bumi
				Tongkat haji samad (3)		Tongkat haji samad	Tongkat haji samad
				Pecah kelambu (14)		Kembang semangkok	Meluar
				Kacip fatimah (8)		Pokok ipoh	Ipoh malai
				Others (60)			
12	8*	Low	23	Tongkat ali (20)		Tongkat ali	Pasak bumi
				Tongkat haji samad (54)		Tongkat haji samad	Tongkat haji samad
				Tapak sulaiman (259)		Tapak sulaiman	Tapak badak
				Pecah kelambu (187)		Pecah kelambu	Jejuang
				Others (763)			
14	6	High	16	Tongkat ali (32)		Tongkat ali	Pasak bumi
				Tongkat haji samad (9)		Tongkat haji samad	Tongkat haji samad
				Kacip fatimah (51)		Kacip fatimah	Merian batu
				Pecah kelambu (89)		Pecah kelambu	Jejuang
				Others (376)			

Note: 1. "*" denotes swampy area.

2. Others in Plot 3, Compartment 13, include akar ipoh (*Antiaris toxicaria*), jelai (*Helminthostachys zeylanica*), paku miding (*Stenochlaena palustris*), lemba (*Curculigo latifolia*) and mempelas (*Tetracera scandens*).

3. Figure in brackets denotes number.

TABLE 4
Economic value of medicinal plant species, AHFR, Puchong Selangor (based on strip-line sampling)

Compartment	Plot No.	Location	Economic value(RM)- green weight		Economic value(RM)- dry weight
			2 ha	1 ha	1 ha
15	1	Low (<400 m)	19.83	9.92	4.96
13	2	Low (<400 m)	2.72	1.36	0.68
13	3	Medium (400-500 m)	11.28	5.64	2.82
12	4	Medium (400-500 m)	118.46	59.23	29.62
15	5	High (700 m)	6.61	3.31	1.66
14	6	High (700 m)	15.66	7.83	3.92
12	7*	Low (<400 m)	155.28	77.64	38.82
12	8*	Low (<400 m)	10.74	5.37	2.69
Total			340.58	170.30	85.17

Note: Av. Price = RM9.50; Av. HC+PM =RM3.88; VMP=RM5.62 per kg.
Note: "*" denotes additional plots
"1" denotes conversion factor (green weight to dry weight = 50%) (Mohd. Azmi 2004)

TABLE 5
Economic value of medicinal plant species, AHFR, Puchong Selangor (based on 100% sampling)

Compartment	Plot No.	Location	Economic value (RM)- green weight		Economic value (RM)-dry weight
			2 ha	1 ha	1 ha
15	1	Low (<400 m)	26.02	13.01	6.51
13	2	Low (<400 m)	3.66	1.83	0.92
13	3	Medium (400-500 m)	28.33	14.17	7.09
12	4	Medium (400-500 m)	407.50	203.75	101.88
15	5	High (700 m)	46.50	23.25	11.63
14	6	High (700 m)	44.06	22.03	11.02
12	7*	Low (<400 m)	1,541.32	770.66	385.33
12	8*	Low (<400 m)	93.69	46.85	23.43
Total		2191.08	1,095.55	547.81	

ensure reliability. This study was intended to provide an indication of economic values of medicinal plants found in AHFR. Such results are of paramount importance as this adds a value to existing values of other non-timber resources quantified by earlier researchers.

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APPENDIX 1

Inventory of tongkat ali (*E. logifolia*) and other medicinal plants

1. State:
2. District:
3. Forest Reserve:
4. Compartment:
5. Block size:
6. Plot No:
7. Type of forest:
8. Headman:
9. No. of crew:
10. Date of inventory:
11. Time in:
12. Time out:
13. Location of mother plane: plot No.:

No.	Type of medicinal plant	Distance from mother plant	Size of stem	Height	Crown width	Leaf		Stem	Flower	Fruits
						Width	Length	Length	No. per tree	No. per tree

Source: Awang Noor and Mohd Shahwahid (1995)

APPENDIX 2
Names of medicinal species in H.S. Ayer Hitam, Puchong, Selangor

No	Local Name	Scientific Name	Orang Asli Name
1	Kembang semangkok	**Scaphium sp.*	Jarak hutan, Meluar, Renung
2	Mempelas	**Tetracera scandens*	Sepelas bulu
3	Jelai	**Helminthostachys zeylanica*	Paku telentang, Paku laga
4	Pecah kelambu	**Dracaena elliptica*	Jejuang
5	Tongkat ali	**Eurycoma longifolia*	Pasak bumi
6	Tongkat haji samad	**Prismatomeris sp.*	Tongkat haji samad
7	Akar ipoh	**Antiaris toxicania*	Ipoh malai
8	Palas	**Licuala kunstleri*	Kelapa puyuh
9	Lemba	**Curculigo latifolia*	Lemba batu
10	Resam	**Gleichenia linearis*	Resam
11	Belimbing batu betina	**Averrhoa carambola*	Kemoyan betina
12	Kancing anjing	**Sclerophyrum pentandrum*	Kancing anjing
13	Merian	**Ardisia elliptica*	Merian kayu
14	Kacip fatimah	**Labisia pumila*	Merian batu
15	Kekunyit	**Coscinium blumeanum*	Kekunyit
16	Pandan tikus	**Freycinetia montana*	Pandan tikus
17	Paku miding	**Stenochlaena palustris*	Paku seleleh
18	Tapak kuda	**Bauhinia sp.*	Akar lepang
19	Tapak sulaiman	**Elephantopus scaber*	Tapak badak
20	Kemoyan jantan	**Homalomena griffithii*	Kemoyan jantan
21	Rancang besi	**Freycinetia mallaccensis*	Rancang besi

* *Source:* Burkill (1935)