

RURAL AND URBAN DEMAND, SUPPLY, DISTRIBUTION AND  
USE OF FUELWOOD AND CHARCOAL FOR  
DOMESTIC PURPOSES IN THAILAND<sup>1/</sup>

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และถ่านในเมืองกับในชนบทของประเทศไทย

by

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บทคัดย่อ

จากการวิเคราะห์ผลการสำรวจผลผลิตการจำหน่ายและการบริโภคถ่าน ซึ่งดำเนินการ  
โดยกองแผนงาน กรมป่าไม้ในปี ๒๕๒๕ พบว่า การผลิตถ่านทั้งประเทศมีปริมาณ ๓,๔๒๗.๕๓ ล้านกก.  
หรือคิดเป็นปริมาตรไม้ท่อนเท่ากับ ๒๒.๕๔ ล้าน ม.<sup>๓</sup> ราคาขายที่หน้าเตาสำหรับถ่านป่าเลน ถ่านเศษ  
ไม้ปลายไม้จากโรงเลื่อย ถ่านไม้ยางพาราและถ่านป่าบกเฉลี่ย ๒.๖๗, ๑.๕๐, ๑.๔๐ และ ๑.๓๔  
บาท/กก. ตามลำดับ ราคาขายจากผู้แทนจำหน่ายหรือพ่อค้าคนกลางอยู่ระหว่าง ๒.๒๑-๓.๒๖ บาท/  
กก. ๒.๒๑-๓.๒๖

การบริโภคถ่านใน ๓ ภาคคือ ภาคครัวเรือน ภาคอุตสาหกรรมและ ภาคบริการสังคม มี  
ปริมาณ ๓,๓๗๘.๓๖ ล้าน กก. รายละเอียดในแต่ละภาคแบ่งตามภาคพื้น และแบ่งเป็นเขตในเมือง  
(เทศบาล + สุขาภิบาล) และเขตชนบทได้แสดงไว้ในการศึกษาด้วย

เมื่อเปรียบเทียบการบริโภคของครัวเรือน ในเขตชนบทกับเขตเมืองแล้วปรากฏว่า  
การบริโภคในเขตชนบทซึ่งถือพลเมือง ๓๓ ล้านคนเป็นฐาน มีปริมาณ ๒,๐๔๗.๖๖ ล้าน กก. เทียบ  
เท่ากับปริมาณไม้ท่อน ๑๓.๗๓ ล้าน ม.<sup>๓</sup> ปริมาณการบริโภคถ่านตก ๐.๔๑ ม.<sup>๓</sup>ต่อหัว การบริโภคในเขต  
เมืองโดยถือพลเมือง ๑๔ ล้านคนเป็นฐานเท่ากับ ๔๔๑.๓๒ ล้าน กก. หรือ ๖.๔๕ ล้าน ม.<sup>๓</sup> ไม้ท่อน  
การบริโภคต่อหัวเท่ากับ ๐.๔๖ ม.<sup>๓</sup> ปริมาณการบริโภคถ่านทั้งประเทศในปี ๒๕๒๕ ถือจำนวนพลเมือง  
๔๗ ล้านคนเท่ากับ ๓,๐๖๔.๔๔ ล้าน กก. หรือ ๒๐.๑๔ ล้าน ม.<sup>๓</sup> ไม้ท่อนปริมาณการบริโภคถ่านต่อ  
หัวเฉลี่ยทั้งประเทศเท่ากับ ๐.๔๓ ม.<sup>๓</sup> ไม้ท่อน

การเปรียบเทียบการศึกษานี้กับปี ๒๕๑๓ และ ๒๕๒๓ แสดงให้เห็นว่าปริมาณการใช้ถ่านใน

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เขตชนบทลดลง ปริมาณการบริโภคถ่านต่อหัวในปี ๒๕๑๓, ๒๕๒๓ และ ๒๕๒๕ แปรจาก ๐.๕๑ ม.<sup>๓</sup> เป็น ๐.๕๔ และ ๐.๕๗ ม.<sup>๓</sup> ตามลำดับ

#### ABSTRACT

Analysis of results from the survey of charcoal production, distribution and consumption conducted by Planning Division, Royal Forest Department in 1982 shows that production of charcoal for the country is 3,427.53 million kg of charcoal or equivalent to 22.54 million cubic meter of roundwood. Selling price at kiln for mangrove, sawmill residue, Para rubber and upland wood charcoal is averaged at 2.67, 1.50, 1.40 and 1.39 Baht/kg respectively. Price as sold by agents or middleman ranges from 2.21-3.26 Baht/kg.

Consumption of 3 sectors, the household sector, industrial sector and social services sector, amount to 3,378.36 million kg; details for each sector by region and by urban (municipal + sanitary) and rural areas are also given.

Comparison of consumption in rural and urban areas shows that: rural consumption taking 33 million population as a base is 2,087.66 million kg, equivalent to 13.73 million m<sup>3</sup> of roundwood and resulting in 0.41 m<sup>3</sup> per caput; urban consumption with 14 million population is 1,291.21 million kg or 8.49 million m<sup>3</sup> roundwood equivalent, per caput is 0.61 m<sup>3</sup>. Total charcoal consumption of the country in 1982, with 47 million population is 3,378.89 million kg or 22.22 million m<sup>3</sup> in roundwood equivalent, per caput consumption is 0.47 m<sup>3</sup> R.E.

Comparison with previous studies in 1970 and 1980 shows less use of fuelwood in rural areas. Per caput consumption of charcoal in 1970, 1980 and 1982 varies from 0.51 to 0.54 and 0.47 m<sup>3</sup>, respectively.

#### BACKGROUNDS

In 1970-1972, a timber trends study for Thailand was carried out by FAO. Some interesting results are shown in Table 1.



Table 1. Consumption of woodfuel by rural and urban area 1970

| Consumption                     | Fuelwood<br>(1) | Charcoal<br>(2) | Woodfuel<br>(3) = (1) + (2) |
|---------------------------------|-----------------|-----------------|-----------------------------|
| Total (million m <sup>3</sup> ) | 24.0            | 20.3            | 44.3                        |
| Rural                           | 23.4            | 15.6            | 39.0                        |
| Urban                           | 0.6             | 4.7             | 5.3                         |
| Per caput (m <sup>3</sup> )     | 0.67            | 0.56            | 1.23                        |
| Rural                           | 0.76            | 0.51            | 1.27                        |
| Urban                           | 0.11            | 0.89            | 1.00                        |
| Per household (m <sup>3</sup> ) | 3.84            | 3.24            | 7.08                        |
| Rural                           | 4.36            | 2.89            | 7.26                        |
| Urban                           | 0.64            | 5.34            | 5.97                        |

Source : De Backer and Openshaw (1972)

From this study, it is estimated that total consumption of woodfuel (fuelwood+charcoal) is 44.3 million cubic meters; per caput consumption for the country is 1.23 m<sup>3</sup> and per household consumption is 7.08 m<sup>3</sup>.

Another study, the rural energy survey, was carried out in 1979-1980, results are summarized in Table 2.

Table 2. Rural consumption of woodfuel 1980

| Consumption               | Fuelwood | Charcoal | Woodfuel |
|---------------------------|----------|----------|----------|
| Total                     |          |          |          |
| (million m <sup>3</sup> ) | 13.33    | 17.72    | 31.05    |
| (million kg)              | -        | 2,848.20 | -        |
| Per rural inhabitant      |          |          |          |
| (m <sup>3</sup> )         | 0.41     | 0.54     | 0.95     |

Source : 1. Sirivadhanakul and Tadyu (1980)  
2. Chantaworapharp (1983)

The study shows that with 32.69 millions of rural population in 1980, the total consumption of woodfuel is  $31,05 \text{ m}^3$  (in roundwood equivalent). Per rural inhabitant consumption is  $0.41 \text{ m}^3$  for fuelwood and  $0.54 \text{ m}^3$  for charcoal amounting to  $0.95 \text{ m}^3$  for woodfuel.

Another report, the hilltribe fuelwood survey (Rueysoongnern, 1980) shows the average estimate of per household use of fuelwood at  $38.26 \text{ m}^3$ , using mean figure for household size of 7.39 (Task Force : Thailand, 1980), the per caput consumption is approximately  $5.18 \text{ m}^3$ . This is about five time of the average Thai per caput consumption ( $1.23 \text{ m}^3$ , see Table 1).

In 1982, a survey of charcoal production, distribution and consumption was carried out by Planning Division, Royal Forest Department. This paper presents some important findings and analyzes the charcoal consumption trends. Most details are previously appeared in report by Ura-peepatanapong and Mungkorndin (1983).

#### CHARCOAL PRODUCTION

There are five major types of charcoal kilns in Thailand. The two most important types used for charcoal production are small oven (or mud beehive type) and earth mound (or graveyard) type. Another three types with less uses are big oven type (or brick beehive type), sawdust mound type and Mark V, respectively. Kiln capacity is in the range of 7-9, 3-4, 50-100, over 30 and  $3-6.5 \text{ m}^3$  for each aforementioned type respectively.

Two kinds of charcoal in the market are recognized, the upland wood charcoal and mangrove charcoal. The upland wood type comprises various species, some popular species are :

- Teng (Shorea obtusa Wall.)
- Rung (Shorea siamensis Mig.)
- Kabark (Anisoptera oblonga Dyer)



Dang (Xylia kerii Craib & Hutch.)  
Pluang (Dipterocarpus tuberculatus Roxb.)  
Takraw (Schleichera oleosa Merr.)  
Yarng (Dipterocarpus spp.)  
Rokpha (Terminalia alata Heyne)

For mangrove charcoal, Kongkang (Rhizophora spp.) is mostly used.

The national reserved forest and working plan forest are major sources of wood for charcoal burning. The left are farm woodlots, sawmills, forest plantations and Para rubber plantations. The most important method for acquisition of wood are self collection. Buying, hire labor for cutting and other methods are also used.

Normally, the bigger kiln type has more capacity. For each time of burning, the big oven type will yield the capacity of 10,640 kg; the sawdust mound type, Mark V, small oven, and earth mound (graveyard) type yield 3,368, 1,984, 1,188 and 586 kg on the average respectively.

Cost of production varies on species of wood, type and kiln capacity, and also methods of production. Simple type of kiln such as earth mound type bears a production cost of 0.66 Baht/kg. Big oven type burning mangrove charcoal may have a cost as high as 1.77 Baht/kg.

Total production for the country has been estimated by Urapeepatanapong and Mungkorndin (1983) at 3,427, 526, 321.87 or around 3,427.53 million kg of charcoal, equivalent to 22.54 million cubic meter of roundwood.

#### CHARCOAL DISTRIBUTION

Selling of charcoal is sometimes done by the producers themselves and may be through agents or middleman who do wholesaling retailing and vending. Selling price at kilns for mangrove, sawmill residue, Para rubber and upland wood charcoal is averaged at 2.67, 1.50, 1.40 and 1.39 Baht per kg respectively. Price as sold by agents or middleman ranges from 2.21 to 3.26 Baht/kg.

Cost of transporting charcoal to buyers differs among localities

and depends on the length of transportation. Transportation cost within local areas ranges from 0.25 to 0.37 Baht/kg.

#### CHARCOAL CONSUMPTION

The survey classified charcoal consumers into three sectors, namely, the household sector, industrial sector and social services sector (restaurants, temples, etc).

1. Household consumption. Consumption in sanitary and municipal areas is regarded as urban consumption. The study shows the consumption of approximately 981.32 million kg or 31.98 percent in urban areas, 2,087.66 million kg or 68.02 percent in rural areas, making 3,068.98 million kg of the total consumption in this sector. Table 3 shows the details.

2. Industrial consumption. The figure of consumption for this sector is quite low because most industries use fuelwood instead of charcoal. The only industry using charcoal as found by the survey is blacksmith which consumes 556,932 kg as shown in Table 4.

3. Social services consumption. This sector comprises of restaurants and temples. It consumes approximately 309.32 million kg of charcoal. Details are shown in Table 5.

4. Total charcoal consumption. For all three sectors, the biggest consumer of charcoal is the household who use about 3,068.98 million kg per year. The next are social services and industrial sectors who consume 309.33 million kg and 0.56 million kg respectively. Total consumption for all sectors is 3,378.86 million kg in 1982 as shown in Table 6.

5. Rural vs. urban consumption. Summing up, rural consumption for the household (in section 1) is 2,087.66 million kg while the urban consumption comprising household of 981.32 million kg, industries of 0.56 million kg and social services of 309.33 million kg totalling 1,291.21 million kg. Comparison is made with roundwood equivalent and per caput consumption in Table 7.



Table 3. Charcoal consumption for household sector 1982

| Region    | Sample | Charcoal consumption (kg/yr) |                  |                    | Total            |
|-----------|--------|------------------------------|------------------|--------------------|------------------|
|           |        | Municipal<br>area            | Sanitary<br>area | Outside<br>(Rural) |                  |
| Central   | 6,368  | 248,926,406.16               | 144,450,522.36   | 531,031,292.88     | 924,408,221.40   |
| East      | 1,490  | 19,169,346.96                | 47,616,482.52    | 98,502,907.68      | 165,288,737.16   |
| Northeast | 3,920  | 82,287,168.72                | 150,140,038.32   | 599,212,146.80     | 831,639,353.84   |
| North     | 4,180  | 75,553,590.40                | 124,167,761.04   | 589,475,605.92     | 789,196,957.36   |
| South     | 3,828  | 56,153,820.36                | 32,851,585.44    | 269,437,016.04     | 358,442,421.84   |
| Country   | 19,786 | 482,090,532.60               | 499,226,389.68   | 2,087,658,969.32   | 3,068,975,691.60 |

Table 4. Charcoal consumption for industrial sector 1982

| Region    | Industry<br>Blacksmith<br>(kg/yr) |
|-----------|-----------------------------------|
| Central   | 453,600                           |
| East      | -                                 |
| Northeast | 48,600                            |
| North     | 27,012                            |
| South     | 27,720                            |
| Country   | 556,932                           |

Note Most industries use fuelwood for energy, only blacksmith uses charcoal.



Table 5. Charcoal consumption for service sector 1982

| Region         | Charcoal consumption (kg/yr) |                      |                       |
|----------------|------------------------------|----------------------|-----------------------|
|                | Restaurant                   | Temple               | Total                 |
| Central        | 155,099,815.00               | 15,024,099.52        | 170,123,914.52        |
| East           | 16,024,992.00                | 854,854.56           | 16,879,846.56         |
| Northeast      | 34,727,431.11                | 1,211,478.16         | 35,938,909.27         |
| North          | 30,024,239.00                | 1,640,803.00         | 31,665,042.00         |
| South          | 54,213,093.60                | 505,984.32           | 54,719,077.92         |
| <b>Country</b> | <b>290,089,570.71</b>        | <b>19,237,219.56</b> | <b>309,326,790.27</b> |

Table 6. Total charcoal consumption by sector 1982

| Region         | Charcoal consumption (kg/yr) |                   |                       | Total                   |
|----------------|------------------------------|-------------------|-----------------------|-------------------------|
|                | Household                    | Industry          | Service               |                         |
| Central        | 924,408,221.40               | 453,600.00        | 170,123,914.52        | 1,094,985,735.92        |
| East           | 165,288,737.16               | -                 | 16,879,846.56         | 182,168,583.72          |
| Northeast      | 831,639,353.84               | 48,600.00         | 35,938,909.27         | 867,626,863.11          |
| North          | 789,196,957.36               | 27,012.00         | 31,665,042.00         | 820,839,011.11          |
| South          | 358,442,421.84               | 27,720.00         | 54,719,077.92         | 413,189,219.76          |
| <b>Country</b> | <b>3,068,975,691.60</b>      | <b>556,932.00</b> | <b>309,326,790.27</b> | <b>3,378,859,413.87</b> |



Table 7. Household charcoal consumption by rural and urban areas 1982

| Area  | Population<br>million | Consumption |                        |                          |
|-------|-----------------------|-------------|------------------------|--------------------------|
|       |                       | million kg. | million m <sup>3</sup> | Per caput m <sup>3</sup> |
| Rural | 33                    | 2,087.66    | 13.73                  | 0.41                     |
| Urban | 14                    | 981.32      | 6.45                   | 0.46                     |
| Total | 47                    | 3,068.98    | 20.18                  | 0.43                     |

Note Charcoal 1 ton (1,000 kg) is equaled to 6.57678 m<sup>3</sup> roundwood equivalent.

Conclusion may be drawn that per caput household consumption of charcoal in 1982 is 0.43 m<sup>3</sup>, being 0.41 m<sup>3</sup> in rural areas and 0.46 m<sup>3</sup> in urban areas. The per caput consumption figures for woodfuel, though not complete, can be summarized in Table 8.

Table 8. Per caput household consumption of woodfuel 1970, 1980 and 1982 (m<sup>3</sup>)

| Area    | Fuelwood | Charcoal | Woodfuel |
|---------|----------|----------|----------|
| 1970    |          |          |          |
| Rural   | 0.76     | 0.51     | 1.27     |
| Urban   | 0.11     | 0.89     | 1.00     |
| Country | 0.67     | 0.56     | 1.23     |
| 1980    |          |          |          |
| Rural   | 0.41     | 0.54     | 0.95     |
| 1982    |          |          |          |
| Rural   | -        | 0.41     | -        |
| Urban   | -        | 0.46     | -        |
| Country | -        | 0.43     | -        |

Results of the 1980 survey suggest a reverse trends of use in fuelwood and charcoal. Fuelwood, used to be a dominant product, is less used in rural areas. Per caput consumption of charcoal in 1970, 1980 and 1982 decreases from 0.51 to 0.54 and 0.43 m<sup>3</sup>, respectively. This suggests many possibilities : more expensive price, from high cost of production due to less availability of wood; inconvenient, due to dirt; and competition from other sources of energy such as LPG and electricity.

#### DEMAND FOR AND SUPPLY OF WOODFUEL

Woodfuel is widely used in cooking, heating water for washing, heating to keep warm, fish curing, protection against animals and insects, preparing animal feed, sugar, tobacco curing, etc. According to FAO (1972), the fuelwood drain has started in Thailand since the seventies. It will intensify and would reach a disastrous dimension of about 30 to 35 million m<sup>3</sup> annually by the mid eighties. Theoretically, this would mean that all the wooded areas, brushland, open woodlands, and finally a substantial part of the forest should be destroyed. Even with 20 percent of the household shifting to non-woodfuels, the demand for charcoal is expected to reach about 10 million tons by the year 2000.

Sirivadhanakul and Tadyu (1980) estimate a deficit of 16.52 million m<sup>3</sup> of woodfuel supply in rural area. With the forest areas shrink to 156,600 km<sup>2</sup> or 30.52 percent of the total land area, corrective measures must be urgently taken. It is evident that natural forests can no more provide sustained yield for woodfuel consumption. Plantations of fast growing species should be created in areas of suitable potentials. Private plantations and community forests should be promoted and supported by the government. With the increasing demands for woodfuel and deficit supply, plantations seem to be the only remedy.

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