

**ACCOUNTING FOR UNMARKETED
FUELWOOD PRODUCTION: 1995
(With 1996-2000 Projections)¹**



**Department of Environment
and Natural Resources**

*Philippine Economic – Environmental
and Natural Resources Accounting System*



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**ACCOUNTING FOR UNMARKETED
FUELWOOD PRODUCTION: 1995
(With 1996-2000 Projections)¹**

ENRAP IV TECHNICAL PAPER

by

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I. INTRODUCTION

One of the adjustments to the conventional national accounts, which the ENRAP framework addresses, is the value of unmarketed production of fuelwood for household use. Studies have shown that most of the substantive consumption and use of fuelwood by rural households do not enter the national accounts (NSCB 1992). A second rationale for focusing on fuelwood production has to do with evidence that shows how unregulated collection of fuelwood from the forest causes negative impacts on the environment.

Thus, the failure to account for unmarketed fuelwood production in the conventional national accounts has two implications in terms of accounting:

1. the gross value added (GVA) of the forestry sector is underestimated, thus the gross national product (GNP) is also underestimated, and
2. the environmental impacts of unregulated fuelwood collection are neglected in the conventional accounts.

Accounting for unmarketed fuelwood production is also in line with Executive Order No. 406 which created and institutionalized the Philippine Economic Environment and Natural Resources Accounting (PEENRA) system, in selected government organizations.

2. NRAP 1 VALUATION (1988 ESTIMATES)

Delos Angeles and Bennagen (1991) presented the following indicators of fuelwood use in the Philippines based on their review of various surveys and studies on fuelwood use conducted by government agencies and private research institutions:

1. per capita fuelwood consumption (cubic meters/ year);
2. average fuelwood collection time (hours/ week);
3. average amount of fuelwood collected (kilograms/ week), and
4. average amount of fuelwood collected and consumed (kilograms/ week).

Using the *labor opportunity cost method*, the value of fuelwood gathered for household consumption in 1988 was estimated to be equal to PhP 4.3 billion. This method equates the value (V) of fuelwood gathering for subsistence consumption with the product of the following variables:

1. average time spent on fuelwood gathering (T);
2. average daily farm wage rate (W), and
3. the total number of households using fuelwood that are self-collected/ gathered (HH).

Mathematically,

$$V = T \times W \times HH.$$

NRAP 1 derived its 1988 estimate with the following assumptions and data inputs:

1. The average fuelwood collection time (T) equals 7.4 hours/ week, or 48 person-days per year (Delos Angeles and Bennagen, 1991).
2. The average daily farm wage rate (W) or the labor opportunity cost equals to PhP 42 per day (Delos Angeles and Bennagen, 1991).
3. Seventy % of the total number of households in the country use fuelwood, 70 % of which are self-collected or gathered (Preliminary results of the 1989 Household Energy Consumption Survey of the Office of Energy Affairs).
4. The household fuelwood consumption rate comes up to 41 % - the percentage of the average amount of fuelwood collected and consumed per week (62.3 kilogram) to the average amount of fuelwood collected per week (151.2 kilogram) (Delos Angeles and Bennagen);
5. Using assumptions (3) and (4), and the 1988 estimated number of households in the Philippines of 10.5 million, the total number of households (HH) using fuelwood that are self-collected equals 2.1 million.

3. ENRAP 3 RE-ESTIMATION

During ENRAP 3, Logarta (1996) re-estimated the 1988 household fuelwood consumption that was built on past efforts (i.e., NRAP 1) and relied on other related secondary data. He noted that since NRAP 1, more reliable estimates of fuelwood consumption based on a large national sample have been published. For instance, a joint study (1992) by the World Bank's Energy Sector Management Assistance Programme (ESMAP) and the OEA came out with new estimates based on the 1989 HECS. Correction factors for fuelwood and charcoal were derived and applied after follow-up spot surveys were conducted in four (4) regions in the country. It showed that the HECS responses consistently underestimated consumption by roughly half, presumably because of measurement error.

Logarta further noted that since the scope of the HECS sample is national, the estimates are better suited to environmental accounting purposes. Furthermore, data from the survey year (1989) gave a better picture of consumption for 1988 as compared to average figures from different years and in comparable sites.

The ESMAP/OEA study also contained the findings of fuelwood supply surveys done in 1990 in four cities and two towns. The average selling prices for fuelwood from gatherers and urban and rural traders are presented in Appendix A. Since the purpose of the re-estimation during ENRAP 3 was to come out with initial but firm lower-bound estimates, the average selling prices of gatherers in Metro Manila were used to value production there, but the prices in Cagayan de Oro City were used for other urban and all rural areas.

Logarta's study came up with an estimate of 17,767,490 metric tons of household fuelwood consumption (13,886,520 metric tons were collected and 3,880,970 metric tons were purchased) as compared to NRAP 1's estimate of 23,811,060 metric tons of household fuelwood consumption (16,667,742 metric tons were collected and 7,143,318 metric tons were purchased),

(Appendix B). Logarta used market data (i.e., farm gate prices) to value the unmarketed fuelwood production (consumption) of households.

The most conservative adjustment to the accounts for unmarketed fuelwood production (consumption) during ENRAP 3 was estimated at PhP 4,266 million. This value is not significantly different from NRAP 1's value of PhP 4,253 million. In real terms (1994=100), the latter is equal to PhP 7,994 million while the former is equal to PhP 8,019 million.

4. FMB-ENRAP 4 REFINEMENTS AND UPDATE

The FMB-ENRAP 4 refinements and update aimed to generate the 1995 estimated value and 1996-2000 projected values of fuelwood gathering for subsistence consumption. To do so, the *market transaction method* was used. This method simply considers value (V) of unmarketed household fuelwood production as follows:

$$V = Q \times P$$

where:

- V - value of unmarketed fuelwood production (or consumption)
- Q - quantity of households' consumption of self-collected/ gathered fuelwood
- P - average farm gate price of fuelwood

A. Quantity (Q) of Household Consumption of Self-Collected/ Gathered Fuelwood

The basic data source used was the *1995 Household Energy Consumption Survey (Main Report and Annexes)* of the Department of Energy (DOE). This report had no data on the *quantity of households' consumption of self-collected/gathered fuelwood (Q)*, but had generated data on the following, which can be used to estimate Q:

1. Annual Household Fuelwood Consumption, Urban and Rural: 1989 and 1995 (*Appendix C*);
2. Annual Quantity of Self-Collected/Gathered Fuelwood by Source, Urban and Rural: 1995 (*Appendix D*).

Delos Angeles and Bennagen (1991) noted that 41 % of the total quantity of self-collected/gathered fuelwood by households in 1989 were for own consumption. In this work, the estimated household rate of consumption of self-collected/gathered fuelwood is denoted as R_c . Using the 1989 and 1995 data on annual household fuelwood consumption (*Appendix C*) and the 1991 R_c of 41 %, and applying ratio and proportion yielded the following R_c values in 1995: 49 % in URBAN areas and 29 % in RURAL areas. See *Table 1* for details.

TABLE 1

Estimated Household Rate of Consumption of Self-Collected/Gathered Fuelwood (R_c),
Urban and Rural: 1995

AREA	1995		1989	
	Annual Household Fuelwood Consumption ('000 Tons)	R_c	Annual Household Fuelwood Consumption ('000 Tons)	R_c
Philippines	14,557	0.33	18,316	0.41
Urban	3,886	0.49 ^{a/}	3,258	na
Rural	10,671	0.29 ^{b/}	15,058	na

^a $0.41 / 3,258 \times 3,886$.

^b $0.41 / 15,058 \times 10,671$.

Meanwhile, the 1995 R_c for urban and rural areas were applied to the annual quantity of self-collected/gathered fuelwood data on Appendix D to estimate Q. The 1995 estimated quantity (Q_e) of households' consumption of self-collected/gathered fuelwood by source, urban and rural, is shown below as Table 2.

TABLE 2

Estimated Quantity (Q_e) of Household Consumption of Self-Collected/Gathered Fuelwood by Source, Urban and Rural: 1995
(In Tons)

AREA	SOURCE		
	Government Lands or Forest	Own and Private Lands	Total
Philippines	428,640	3,990,321	4,418,961
Urban	153,369	1,427,748	1,581,117
Rural	275,271	2,562,573	2,837,844

B. Average Farm Gate Price (P) of Fuelwood

There are no fuelwood farm gate price (P) data available for 1995. Thus, this work used the fuelwood gatherers' selling prices (in Metro Manila, Cebu, Isabela and Tacloban) of the *1990 Fuelwood Supply Studies of the Non-Conventional Energy Division (NCED)* of the DOE as benchmark data (Appendix A). Metro Manila and Cebu were considered by the ENRAP-FMB PEENRA team to represent urban areas, while Isabela and Tacloban represented rural areas. Weighted averages per area were derived to estimate the 1990 average farm gate price (P_a) of fuelwood. (The weights were computed using data shown in Appendix E.) Results of the computations are reflected in Table 3 below.

TABLE 3

Weights required to estimate the 1990 Average Farm Gate Price of Fuelwood in the Philippines, Urban and Rural

AREA CLASSIFICATION/ REGION	1995 ANNUAL QTY OF SELF-COLLECTED/ GATHERED FUELWOOD (In Tons)	WEIGHTS
URBAN	1,354,620	
National Capital Region	34,642	0.03
Region VII	1,319,978	0.97
RURAL	1,788,289	
Region II	551,751	0.31
Region VIII	1,236,538	0.69

Applying the derived weights to the benchmark data (Appendix A) would yield the following estimated 1990 farm gate prices of fuelwood: P 615 for urban areas and P 334 for rural areas (Table 4).

TABLE 4

Estimated Average Farm Gate Price (P_e), Urban and Rural: 1990
(Peso/ton)

AREA CLASSIFICATION/ PROVINCE	1990 Wood Gatherers' Average Selling Price for Fuelwood	Weights	1990 P _e
URBAN			615
Metro Manila	140	0.03	
Cebu	630	0.97	
RURAL			334
Isabela	500	0.31	
Tacloban	260	0.69	

Meanwhile, the required 1995 P_e was simply derived through ratio and proportion. Given the 1990 and 1995 Consumer Price Index (CPI) for fuel, for all income households (1988 = 100), the 1995 P_e for urban and rural areas were respectively equal to PhP 962 and PhP 523. The estimated average farm gate price of fuelwood in urban and rural areas for the years 1990 and 1995 are shown in Table 5 below.

TABLE 5

Estimated Farm Gate Price (P_e) of Fuelwood, Urban and Rural:
1990 and 1995
(Peso/ton)

YEAR	CPI for Fuel (1988 = 100)	P _e	
		URBAN	RURAL
1995	209.4	962	523
1990	133.8	615	334

C. Value (V) of Unmarketed Fuelwood Production (or Consumption), 1995

Using the *Market Transaction Method*, the 1995 value of unmarketed fuelwood production (or consumption) was computed at PhP 3.0 billion; PhP 2.7 billion or 90.3 % of which came from *own and private lands* and a minimal PhP 0.3 billion or 9.7 % from *government land or forests*. In 1994 prices, these values are equal to the following: PhP 2.5 billion for *own and private lands*, PhP 0.3 billion for *government land or forests*, and PhP 2.8 billion for both sources of self-collected/gathered fuelwood. The 1995 Consumer Price Index (1994 = 100) is equal to 108 (For more detailed information, see Table 6).

D. Projected Values of Unmarketed Fuelwood Production (or Consumption)

The annual percentage change of the projected populations of the Philippines from 1995 to 2000 (**Appendix F**) was used to estimate the value of unmarketed fuelwood production (or consumption) from 1996 to 2000. (This was done on the assumption that these two variables, value of unmarketed fuelwood and population growth, have a direct relationship with one another.) **Table 7** presents these values at 1994 constant prices, while **Appendix G** shows the Consumer Price Index (1994 = 100) from 1995 to 1999.

TABLE 6

Computed Value (V_c) of Unmarketed Fuelwood Production (or Consumption) by Source and Area: 1995

SOURCE/ AREA	P _c (Peso/ton)		Q _c (Tons)	V _c (In Peso)	
	Nominal	Real (1994 = 100)		Nominal	Real (1994 = 100)
GOV'T LAND OR FORESTS			428,640	291,507,711	269,914,547
Urban	962	891	153,369	147,540,978	136,612,017
Rural	523	484	275,271	143,966,733	133,302,531
OWN & PRIVATE LANDS			3,990,321	2,713,719,255	2,512,703,014
Urban	962	891	1,427,748	1,373,493,576	1,271,753,311
Rural	523	484	2,562,573	1,340,225,679	1,240,949,703
TOTAL			4,418,961	3,005,226,966	2,782,617,561
Urban	962	891	1,581,117	1,521,034,554	1,408,365,328
Rural	523	484	2,837,844	1,484,192,412	1,374,252,233

Note:

1. 1995 CPI₁₉₉₄₌₁₀₀ = 108
2. V_c (Real (1994=100)) = V_c (Nominal) / 1995 CPI₁₉₉₄₌₁₀₀ × 100
3. P_c (Real (1994=100)) = P_c (Nominal) / 1995 CPI₁₉₉₄₌₁₀₀ × 100
4. The product of P_c (Real) and Q_c may not be exactly equal to V_c (Real) due to rounding off of P_c (Real).
Real: 1994=100

TABLE 7

**Projected Values (Real) of Unmarketed Fuelwood Production
(or Consumption) by Source: 1996 – 2000
(In Peso, (1994=100))**

YEAR	SOURCE		
	Gov't. Land or Forests	Own & Private Lands	Total
1996	253,261,209	2,357,672,864	2,610,934,073
1997	244,712,932	2,278,094,780	2,522,807,712
1998	227,883,399	2,121,424,387	2,349,307,786
1999	218,347,736	2,032,654,481	2,251,002,217
2000	-	-	-

5. RESULTS AND TRENDS

As can be seen in Table 1, the annual household fuelwood consumption in the rural areas decreased by 29.13 % from 1989 to 1995, while it increased by 19.28 % in the urban areas. Regardless of the area, the annual household fuelwood consumption in the country decreased by 20.52 % during the period in review.

On the quantity of household consumption of self-collected/gathered fuelwood, Table 2 shows that the bulk (90.3%) of the self-collected/gathered fuelwood that were consumed by households in 1995 came from their own and private lands. This only shows that a minimal 9.7 % came from government land or forests (Figure 1).

As expected, the average estimated farm gate prices of fuelwood for years 1990 and 1995 (Table 5) are higher in the urban areas than in the rural areas by approximately 84 %.

The estimated quantity of household consumption of self-collected/gathered fuelwood in 1995 (Table 2 and Table 6) equals 4,419 thousand tons. Compared to the ENRAP 3 estimate of 13,886 thousand tons (Appendix B), the estimated quantity of household consumption of self-collected/gathered fuelwood was lower by 68.18 %.

Using Figures 2 and 3 as references, it can be observed that there is a marked increase in the number of households using fuelwood from 1989 to 1995. Similarly, households using self-collected/gathered fuelwood increased. The quantity and value (real) of unmarketed fuelwood production (or consumption), however, decreased from 1988 to 1995.

Based on the above trends, it should be noted that although households prefer to use fuelwood than other forms of fuel (as evidenced by the increased number of households using fuelwood), the decrease in the volume and value of fuelwood used indicates the depletion of an already limited resource.

6. POLICY IMPLICATIONS

- a) *On fuelwood use.* As shown by the study, most of the fuelwood volume gathered is unrecorded. If this goes on, the practice will have detrimental effects on the environment. It is therefore recommended that fuelwood gathering in forest areas be regulated. At the same time, the private sector should be encouraged to plant trees for fuelwood purposes in their lands. In this connection, the government needs to have an information dissemination program regarding the matter.
- b) *On data sources.* As experienced in the conduct of the study, it was very difficult to get hold of data/studies on the actual volume of unmarketed fuelwood production. It is therefore recommended that more studies be undertaken that would generate data on the quantity and value of unmarketed fuelwood consumption not only by households but also by commercial establishments.
- c) *On pricing.* It was also noted in the study that fuelwood is priced very low. This may be due to the unregulated nature of fuelwood production. It is recommended that further studies be undertaken to determine the appropriate pricing mechanism and marketing structure for the product.
- d) *On environmental impacts.* Studies on the environmental costs of fuelwood use should also be conducted.

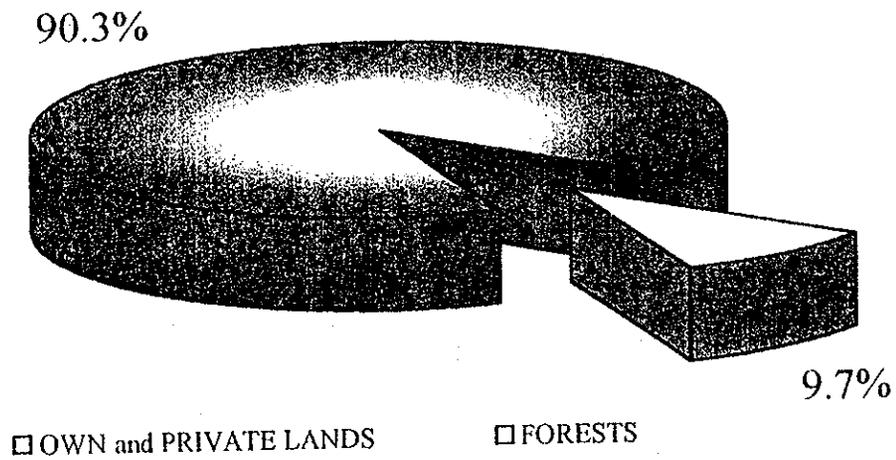
7. LIMITATIONS OF THE STUDY

- a) A similar computation could not be done for charcoal due to lack of data. Only the data on the number of households using and the quantity of self-produced charcoal in 1995 are available. (Based on the 1995 HECS, the former is equal to 1,181 households while the latter is equal to 261,476 tons.) Data on household rate of consumption of self-produced charcoal are not available.
- b) The 1995 HECS and other references have no data on the quantity of households' consumption of self-collected/gathered fuelwood. The data had to be either generated or estimated.
- c) No data was available on fuelwood farm gate prices for 1995. The data was computed using the fuelwood gatherers' selling prices (in Metro Manila, Cebu, Isabela and Tacloban) in the 1990 Fuelwood Supply Studies of the NCED.

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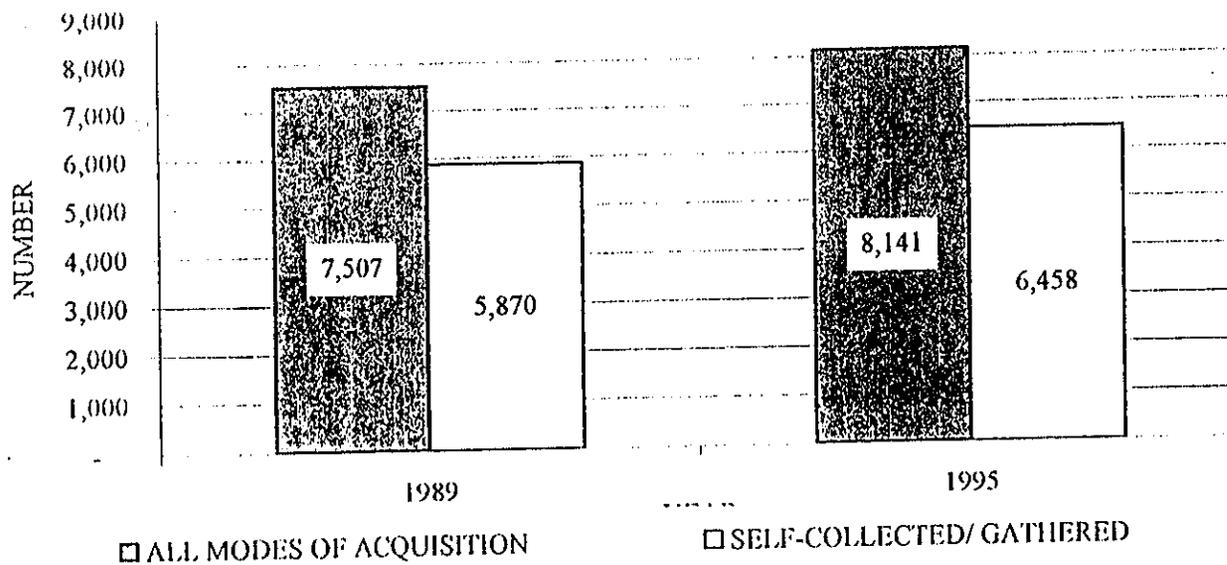
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Figure 1. PERCENTAGE DISTRIBUTION OF REAL VALUE OF UNMARKETED FUELWOOD PRODUCTION BY SOURCE: 1995 (1994=100)



The 1995 real estimate of unmarketed fuelwood production (consumption) equals P 2.8 Billion. A minimal amount of P 0.3 Billion or 7 % came from government land or forests.

**Figure 2. NUMBER OF HOUSEHOLDS USING FUELWOOD
(ALL MODES OF ACQUISITION & SELF-COLLECTED/ GATHERED):
1989 AND 1995**



Based on the 1995 Household Energy Consumption Survey (HECS), the total number of households using fuelwood (all modes of acquisition) went up by 8.45 % from 1989 to 1995. Similarly, households using self-collected/gathered fuelwood increased by 10.02 %.

APPENDIX A
PRICE BUILD-UP FOR URBAN FUELWOOD AVERAGE SELLING PRICE
(In pesos per metric ton)

	Metro Manila	Cebu City	Cagayan de Oro	Tacloban	Isabela
Wood Gatherers	140	630	210	260	500
Rural Traders	650	820	630	630	650
Urban Traders	930	1,100	930	1,000	na

Source: Fuelwood Supply Studies, Non-Conventional Resources Division (NCRD), DOE in conjunction with Affiliated Non-Conventional Energy Centers (ANECs), 1990.

APPENDIX B
NRAP I AND NRAP III (REVISED) ESTIMATES OF HOUSEHOLD FUELWOOD CONSUMPTION, PHILIPPINES: 1988

Mode of Acquisition	Fuelwood Consumption (MT)	
	NRAP I	NRAP III
BOTH	23,811,060	17,767,490
Collected	16,667,742	13,886,520
Purchased	7,143,318	3,880,970

Source: Logarta, J.D., Jr., "Biomass Energy in Environmental and Natural Resources Accounting: Adjustment to Earlier Estimates," Vol. IV In The Philippine Environmental and Natural Resources Accounting Project (ENRAP III): Refinements of Accounts.

APPENDIX C
ANNUAL HOUSEHOLD FUELWOOD CONSUMPTION, URBAN AND RURAL: 1989 AND 1995
(In '000 tons)

AREA	1995	1989
Philippines	14,557	18,316
Urban	3,886	3,258
Rural	10,671	15,058

Source: 1995 Household Energy Consumption Survey (HECS), Department of Energy.

APPENDIX D
ANNUAL QUANTITY OF SELF-COLLECTED/ GATHERED FUELWOOD
BY SOURCE, URBAN AND RURAL: 1995
(In tons)

AREA	SOURCE		
	Both	Own & Private Lands	Government Lands or Forests
Philippines	13,012,436	11,750,230	1,262,206
Urban	3,226,769	2,913,772	312,997
Rural	9,785,667	8,836,457	949,210

Source: 1995 Household Energy Consumption Survey (HECS), Department of Energy.

APPENDIX E
ANNUAL QUANTITY OF SELF-COLLECTED/ GATHERED FUELWOOD IN THE
NATIONAL CAPITAL REGION (NCR), REGION 2, REGION 7 AND REGION 8: 1995
(In tons)

REGION	QUANTITY
NCR	34,642
Region 2	551,751
Region 7	1,319,978
Region 8	1,236,538

Source: 1995 Household Energy Consumption Survey (HECS), Department of Energy.

APPENDIX F
PROJECTED POPULATIONS, PHILIPPINES: 1995-2000
(Medium Series)

YEAR	POPULATION	% CHANGE
1995	68,349,452	2.34
1996	69,951,810	2.28
1997	71,549,790	2.23
1998	73,147,776	2.18
1999	74,745,756	2.14
2000	76,348,114	

Source: 1995 Census-Based National, Regional and Provincial Population Projections (Vol.II), National Statistics Office.

APPENDIX G
CONSUMER PRICE INDEX (CPI), PHILIPPINES: 1995-1999
(1994=100)

YEAR	CPI
1995	108.0
1996	117.8
1997	124.7
1998	136.9
1999	146.0

Source: National Statistics Office.