

# Session 7. Biofuels production and transformation data

*Workshop on the Strategic Framework for the African Bioenergy Data Management*

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# Outline

- Introduction
- What data are needed
  - FAO wood energy survey
  - Good and best practices to get these data.
- Conclusion

# Introduction

- Energy information collected in typical household surveys usually focused on households as consumers:
  - Type and/or amount of fuel used
  - Costs
  - Type of stove/heater/light appliances used
- However, households can collect their own wood, trade it, and transform it into charcoal
  - They can also produce/use biogas and other biomass
- We talked yesterday about enterprise surveys to collect data on bioenergy production by establishments (fuelwood, charcoal, byproducts, etc.), so today we focus on bioenergy production/ transformation by households

# Production and transformation data – data needs

- The FAO wood energy questionnaire (technically a Woodfuel Supplementary Module to use in existing household surveys) addresses bioenergy production/ transformation by households
- It starts with classificatory questions (geographical, rural/urban, etc.)
- Then it includes a household roster, with characteristics of all dwellers
- It asks about uses (finality, quantities) in a week:

## 3. What was the **usual amount** of fuelwood consumed by the household **in one day**?

A. WEIGHT					B. VOLUME						
Type	Quantity (No)	Unit Weight (kg)	Total Weight (kg)	Type of weight 1 Measured 2 Estimated	Type	d1 (m)	d2 (m)	L (m)	Volume (m <sup>3</sup> )	Tree species	Type of Volume 1 Measured 2 Estimated
1 bundle 2 sack 3 Log 4 _____					1 Log 2 Truck 3 Load 4 _____						

# Production and transformation data – data needs

- For:
  - Cooking,
  - Barbequing,
  - Heating,
  - Other domestic uses,
  - Agricultural uses,
  - Commercial uses, and
  - Cultural/religious uses

LIST CODE	5. In the <b>last 7 days</b> , did your household use fuelwood for:		ANSWER CODE
	YES ..... 1	NO.....2	
01	Cooking at home?		
02	Having picnic, barbeque?		
03	Space heating?		
04	Other domestic uses, such as lighting, warming water for bathing, laundering, ironing, or smoking against insects?		
05	Agricultural uses, such as roasting coffee, curing tobacco, preparing feed for animals, heating greenhouses, poultry-houses or swine-houses?		
06	Commercial uses, such as baking bread, smoking fish, brewing alcoholic beverages, vending street food, running artisanal workshops or micro-industries [excluding charcoal production]?		
07	Cultural or religious uses, such as cremations, incense burning, other religious rituals or cultural traditions?		

# Production and transformation data – data needs

- The FAO wood energy questionnaire asks about acquisition of fuelwood in a year
  - If fuelwood collected or cut, it asks about sources and time used (next slide)

2.B ACQUISITION OF FUELWOOD														
7. In the last 12 months, did you or any member of your household:		8. How Frequently?		9. What was the [Frequency] Amount acquired by the household? (Please form a bundle).										10. What was the [Frequency] Expenditure on fuelwood of the household?
YES ..... <input type="checkbox"/> 1      NO ..... <input type="checkbox"/> 2		Daily..... 1    Quarterly.....5 Weekly..... 2    Half-yearly..... 6 Forthnightly 3    Yearly.....7 Monthly.....4    Other ..... 8		A. WEIGHT					B. VOLUME					
LIST CODE	ANSWER CODE	Type	Quantity (No)	Unit Weight (kg)	Total Weight (kg)	Type of weight	Type	d1 (m)	d2 (m)	L (m)	Volume (m <sup>3</sup> )	Tree species	Type of Volume (1)	
		1 Bundle 2 Sack 3 Log 4 _____				1 Measured 2 Estimated	1 Log 2 Truck 3 Load 4 _____						1 Stacked v. 2 Solid v.	1 Measured v. 2 Estimated v.
01	Purchase fuelwood?													
02	Receive fuelwood as payment in-kind?													
03	Receive fuelwood in exchange for other goods (barter)?													
04	Receive fuelwood as a gift?													
05	Cut or collect fuelwood? <span style="border: 1px solid black; padding: 2px;">If No, Skip Section 2.C</span>													

# Production and transformation data – data needs

- The FAO wood energy questionnaire asks about collection, sales and gifting of fuelwood

## 2.C COLLECTION OF FUELWOOD

<p><b>11. Where did you MAINLY cut or collect fuelwood?</b></p> <p>1. Natural Forests</p> <p>2. Forest Plantations</p> <p>3. Bush, river banks [and other wild systems]</p> <p>4. Own farm or yard <input type="checkbox"/></p> <p>5. Other agricultural land</p> <p>6. Urban area, Village area, Roadside</p> <p>7. Construction sites, dumps</p> <p>8. Other (Specify) _____</p>	<p><b>12. How long does it take to:</b></p> <p>1. Go from your house to the main collecting area and back?</p> <table border="1"> <tr> <th>Hours</th> <th>Minutes</th> </tr> <tr> <td><input type="text"/></td> <td><input type="text"/></td> </tr> </table> <p>2. Cut or collect fuelwood?</p> <table border="1"> <tr> <th>Hours</th> <th>Minutes</th> </tr> <tr> <td><input type="text"/></td> <td><input type="text"/></td> </tr> </table>	Hours	Minutes	<input type="text"/>	<input type="text"/>	Hours	Minutes	<input type="text"/>	<input type="text"/>	<p><b>13. Which household members participated in fuelwood collection?</b> [Use the same codes as those provided in Section 1, Roster]</p> <p>YES ..... <input type="text"/> <input type="text"/> <b>1</b>      NO ..... <input type="text"/> <input type="text"/> <b>2</b></p> <p>[Member 1] <input type="text"/>      [Member 7] <input type="text"/></p> <p>[Member 2] <input type="text"/>      [Member 8] <input type="text"/></p> <p>[Member 3] <input type="text"/>      [Member 9] <input type="text"/></p> <p>[Member 4] <input type="text"/>      [Member 10] <input type="text"/></p> <p>[Member 5] <input type="text"/>      [Member 11] <input type="text"/></p> <p>[Member 6] <input type="text"/>      [Member 12] <input type="text"/></p>	<p><b>14. Please list the month(s) of the year, if any, when fuelwood is mostly unavailable.</b></p> <p>ALWAYS AVAILABLE ... 99 <input type="text"/></p> <table border="1"> <tr> <td>January</td> <td><input type="text"/></td> <td>July</td> <td><input type="text"/></td> </tr> <tr> <td>February</td> <td><input type="text"/></td> <td>August</td> <td><input type="text"/></td> </tr> <tr> <td>March</td> <td><input type="text"/></td> <td>September</td> <td><input type="text"/></td> </tr> <tr> <td>April</td> <td><input type="text"/></td> <td>October</td> <td><input type="text"/></td> </tr> <tr> <td>May</td> <td><input type="text"/></td> <td>November</td> <td><input type="text"/></td> </tr> <tr> <td>June</td> <td><input type="text"/></td> <td>December</td> <td><input type="text"/></td> </tr> </table>	January	<input type="text"/>	July	<input type="text"/>	February	<input type="text"/>	August	<input type="text"/>	March	<input type="text"/>	September	<input type="text"/>	April	<input type="text"/>	October	<input type="text"/>	May	<input type="text"/>	November	<input type="text"/>	June	<input type="text"/>	December	<input type="text"/>
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## 2.D FUELWOOD SOLD AND GIVEN FOR FREE

<p><b>15. In the last 12 months, did you or any member of your household:</b></p> <p>YES ..... <input type="text"/> <input type="text"/> <b>1</b>      NO ..... <input type="text"/> <input type="text"/> <b>2</b></p>	<p><b>16. How Frequently?</b></p> <p>Daily..... 1    Quarterly.....5</p> <p>Weekly..... 2    Half-yearly..... 6</p> <p>Forthnightly 3    Yearly.....7</p> <p>Monthly..... 4    Other.....8</p>	<p><b>17. What was the [Frequency] Amount sold [given for free] by the household?</b></p> <table border="1"> <thead> <tr> <th colspan="5">A. WEIGHT</th> <th colspan="5">B. VOLUME</th> </tr> <tr> <th>Type</th> <th>Quantity (No)</th> <th>Unit Weight (kg)</th> <th>Total Weight (kg)</th> <th>Type of weight</th> <th>Type</th> <th>d1 (m)</th> <th>d2 (m)</th> <th>L (m)</th> <th>Volume (m<sup>3</sup>)</th> <th>Tree species</th> </tr> <tr> <td>1 Bundle 2 Sack 3 Log 4</td> <td></td> <td></td> <td></td> <td>1 Measured 2 Estimated</td> <td>1 Log 2 Truck 3 Load 4</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>										A. WEIGHT					B. VOLUME					Type	Quantity (No)	Unit Weight (kg)	Total Weight (kg)	Type of weight	Type	d1 (m)	d2 (m)	L (m)	Volume (m <sup>3</sup> )	Tree species	1 Bundle 2 Sack 3 Log 4				1 Measured 2 Estimated	1 Log 2 Truck 3 Load 4																	<p><b>18. What was the [Frequency] Revenue obtained from fuelwood sales?</b></p>
A. WEIGHT					B. VOLUME																																																		
Type	Quantity (No)	Unit Weight (kg)	Total Weight (kg)	Type of weight	Type	d1 (m)	d2 (m)	L (m)	Volume (m <sup>3</sup> )	Tree species																																													
1 Bundle 2 Sack 3 Log 4				1 Measured 2 Estimated	1 Log 2 Truck 3 Load 4																																																		
<b>01</b>	Sell fuelwood?																																																						
<b>02</b>	Give fuelwood to others for free?																																																						

# Production and transformation data – data needs

- The FAO wood energy questionnaire asks about uses of charcoal (finality, quantities) in a week:
  - For cooking, heating, other domestic uses, agricultural uses, commercial uses and cultural/religious uses
- It also asks about acquisition in a year, including own production

LIST CODE	ANSWER CODE
01	Purchase charcoal?
02	Receive charcoal as <b>payment in-kind</b> ?
03	Receive charcoal in exchange for other goods ( <b>barter</b> )?
04	Receive charcoal as a <b>gift</b> ?
05	Produce charcoal? <small>If No, Skip Section 3,C</small>

6. In the **last 12 months**, did you or any member of your household:

YES .....  1      NO .....  2

7. How Frequently?

Daily..... 1    Quarterly.....5  
 Weekly..... 2    Half-yearly..... 6  
 Fortnightly 3    Yearly.....7  
 Monthly.....4    Other \_\_\_\_\_ 8



# Production and transformation data – data needs

- The FAO wood energy questionnaire asks about production of charcoal, including:
  - Quantities, tree species, source of wood, type of kiln
  - Time spent

3.C PRODUCTION OF CHARCOAL												
<b>10. What was the [Frequency, Q.9] Amount of wood used to produce charcoal?</b>						<b>11. How did you MAINLY obtain the wood used to produce charcoal?</b>						<b>12. What type of kiln was used to produce charcoal?</b>
A. WEIGHT					B. VOLUME							
Type	Quantity (No)	Unit Weight (kg)	Total Weight (kg)	Type of weight 1 Measured 2 Estimated	Type 1 Logs 2 Truck 3 Load 4 _____	Quantity (No)	Unit Volume (m <sup>3</sup> )	Total Volume (m <sup>3</sup> )	Tree species	Type of Volume (1) 1 Stacked 2 Solid	Type of Volume (2) 1 Measured 2 Estimated	
1 Logs 2 _____												
<b>13. How many days does charcoal production require?</b>						<b>14. Which household members participated in charcoal production? [Use the same codes as those provided in Section 1. Roster]</b>						1. Earth pit..... 2. Earth mound..... 3. [Other traditional kiln]..... 4. Casamance..... 5. Brick kiln..... 6. Steel kiln..... 7. Portable steel kiln..... 8. [Other improved kiln].....
Days (No)		<b>This includes:</b> - Going from home to the main charcoal production area and back; - Acquiring and transporting wood; - Preparing the kiln; - Burning wood and discharging charcoal.				[Member 1]	<input type="checkbox"/>	[Member 7]	<input type="checkbox"/>			
						[Member 2]	<input type="checkbox"/>	[Member 8]	<input type="checkbox"/>			
						[Member 3]	<input type="checkbox"/>	[Member 9]	<input type="checkbox"/>			
						[Member 4]	<input type="checkbox"/>	[Member 10]	<input type="checkbox"/>			
						[Member 5]	<input type="checkbox"/>	[Member 11]	<input type="checkbox"/>			
						[Member 6]	<input type="checkbox"/>	[Member 12]	<input type="checkbox"/>			

# Production and transformation data – data needs

- The FAO wood energy questionnaire also asks about
  - Sales and gifting of charcoal
  - Types of stoves and heaters (and fuel used)
  - Appliances, whether indoor or outdoor, number of windows
  - Health problems

# Production and transformation data – Good and best practices

## ENUMERATOR

### How to weigh wood?

Form a bundle (or fill a sack) with the actual quantity of fuelwood used for the first declared use and weigh it with the provided scale. If quantity is such that more than one bundle should be formed, weigh only one bundle and ask the total number of bundles (or sacks) used. Total quantity must be expressed in kg. Following quantities [also in the following sections of the module] should be expressed in terms of number of bundles/sacks like the one weighed, allowing for fractions. Hence, fuelwood should only be weighed once.

### How to estimate volume?

Record the values of diameters at mid-log ( $d_1$  and  $d_2$ ) and the length ( $L$ ) of the log in the appropriate boxes. The three measures must be expressed in meters. Then calculate the volume using the Huber formula:  $V = \{[(d_1+d_2)/2]^2 * 3.1416/4\} * L$ . The final weight is obtained by multiplying the volume by the density coefficient of wood, which depends on the tree species.

- Good and best practices include the training of enumerators, cue cards, glossary and reference documents

FIGURE 3. A CALIPER.



FIGURE 1. BUNDLE OF FUELWOOD.

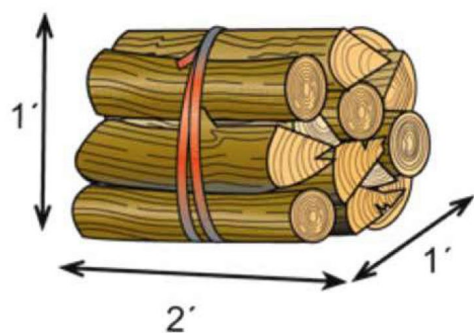


FIGURE 8. MEASURING TAPE.



### How to estimate weight?

Weight should only be estimated when there is no wood to weigh at home at the time of the interview, but wood was actually used during the reference period. The respondent should estimate the daily amount of wood using a unit of measurement of its choice (for instance: load, truck, etc.) although the final estimate should always be expressed either in kg or in  $m^3$ .

### How to measure wood moisture?

Insert the metallic tips of the provided hygrometer into the wood used to form the bundle, then [select the wood species among those listed and] record the value of moisture shown on the display of the hygrometer.

# Production and transformation data – Good and best practices

FIGURE 4. HYGROMETER (1).



FIGURE 5. HYGROMETER (2).



- Flash cards

FIGURE 6. HYGROMETER (3).



FIGURE 7. HYGROMETER (4).



# Production and transformation data – Good and best practices

## ENUMERATOR

### How to weigh charcoal?

Fill a sack and weigh it with the provided scale. If the amount of charcoal used in one day is bigger than the capacity of the sack, ask the respondent to estimate the number of sacks like the one weighed, then multiply the observed weight by the number of sacks declared to obtain the total weight (in kg).

### How to estimate weight?

Weight should only be estimated when there is no charcoal to weigh at home at the time of the interview, but charcoal was actually used during the reference period. The respondent should estimate the amount of charcoal consumed in one day using a unit of measurement of its choice, although the final estimate should always be expressed in kg.

- Good and best practices include the training of enumerators, cue cards, glossary and reference documents

FIGURE 2. A SPRING SCALE.



# Production and transformation data – Good and best practices

TYPES OF KILN: EARTH MOUND



- Flash cards

TYPES OF KILN: STEEL KILN



TYPES OF KILN: EARTH MOUND WITH CHIMNEY (CASAMANCE)



FIGURE 9.  
EARTH PIT (1).



FIGURE 10.  
EARTH PIT (2).



FIGURE 11.  
EARTH MOUND.



FIGURE 12.  
CASAMANCE (IMPROVED EARTH MOUND).

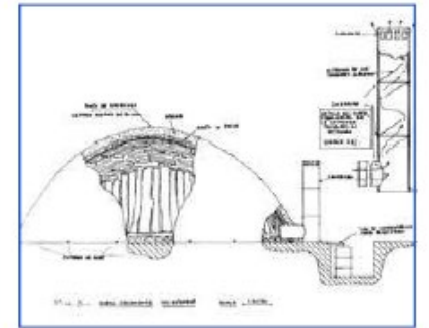


FIGURE 13.  
BRICK KILN.



FIGURE 14.  
RETORT (AN IMPROVED STEEL KILN).



# Production and transformation data – Good and best practices

SOURCE OF WOOD: NATURAL FOREST



SOURCE OF WOOD: FOREST PLANTATION



- Flash cards

# Conclusion

- There is methodology available for collecting data on wood production and transformation into charcoal, for example the FAO Woodfuel Supplementary Module into Existing Household Surveys in Developing countries
- The module can be used as a stand-alone survey, or added to existing surveys
- National Statistical Offices have expertise in running surveys (sampling, designing, etc.), while energy commissions/ministries/agencies have expertise in energy.
  - Other institutions may have an interest and/or a role to play
  - Cooperating and coordinating can avoid waste of time and resources
- Surveys are costly, but assistance is available internationally (AFREC, FAO, World Bank, UNSD, AfDB?)





**United  
Nations**

**Statistics  
Division**

# Thank you.

**Contact**

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