



Food and Agriculture Organization  
of the United Nations

# **How to Include the Woodfuel Supplementary Module into Existing Surveys and Derive Woodfuel Indicators**

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the Global Strategy to improve Agricultural and Rural Statistics

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# Acronyms and Abbreviations

AFWC	African Forestry and Wildlife Commission
CAPI	Computer-Assisted Personal Interviewing
CASI	Computer-Assisted Self-Interviewing
CATI	Computer-Assisted Telephone Interviewing
CAWI	Computer-Assisted Web Interviewing
CEPAL	Comisión Económica para América Latina y el Caribe
CFSVA	Comprehensive Food Security and Vulnerability Analysis
D, D <sub>eff</sub> , deff	Design effect
DHS	Demographic and Health Survey
EA	Enumeration Area
EGM	Expert Group Meeting
EMS	E-Mail Surveys
EPA	Environmental Protection Agency
ESMAP	Energy Sector Management Assistance Programme
FAO	Food and Agriculture Organization of the United Nations
GPS	Global Positioning System
GSARS	Global Strategy to Improve Agricultural and Rural Statistics
IFPRI	International Forestry Resources and Institutions
IKI	International Climate Initiative of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, Germany.
ILO	International Labour Organization
LFS	Labour Force Surveys
LSMS	Living Standards Measurement Study
LSMS-	Living Standards Measurement Study – Integrated Survey on Agriculture
ISA	Multiple Indicator Cluster Survey
MICS	Multi-Tier Framework
MTF	Net Calorific Value
NCV	National Household Survey
PAPI	Paper-and-Pencil Interviewing
PPS	Probability Proportional to Size
PSU	Primary Sampling Unit
SAC	Scientific Advisory Committee
SDG	Sustainable Development Goal
SE	Standard Error
UNDESA	Department of Economic and Social Affairs of the United Nations
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WB	World Bank
WBS	Web-Based Survey

WHO	World Health Organization
WFP	World Food Programme
WSM	Woodfuel Supplementary Module

# Introduction

Because available data on woodfuel production and consumption at the household level are scarce, the impacts of such activities on local economies, livelihoods and the environment in developing countries are not well understood. The project entitled “Developing a Methodology on Incorporating a Woodfuel Module into Existing National Surveys in Developing Countries” – jointly implemented by the Global Strategy to Improve Agricultural and Rural Statistics (Global Strategy) and the FAO (Food and Agriculture Organization of the United Nations) Forestry Department – is intended to fill this information gap through the development of the Woodfuel Supplementary Module (WSM) to be incorporated into existing household surveys.

The first step of the project consisted of a literature review on national statistics, studies and recommendations related to woodfuel production and consumption at the household level in developing countries, which was included in Technical Report 1.<sup>1</sup> The second step of the project entailed identifying the surveys in which the WSM should be incorporated and developing a short form of the module.<sup>2</sup>

The present technical report constitutes the outcome of the third step of the project. Its main goals are: (a) to introduce a revised version of the short form and the long form of the WSM; (b) to describe the proposed methodology to incorporate the WSM into existing surveys; and (c) to describe the indicators of consumption and production of woodfuel that can be derived from the data collected through the module; these indicators can be used for monitoring progress towards achieving some of the Sustainable Development Goals<sup>3</sup> and formulating country-specific policies.

This report is intended to be a living document: many aspects of the proposed methodology – including the module itself – will undergo significant modifications after the implementation of the next steps of the project (see Annex 1). Most of the suggestions provided by the members of the Scientific Advisory Committee of the Global Strategy at a meeting held in Rome on 28 February 2017 are already an integral part of the proposed methodology. Other suggestions have been collected during an expert consultation held in Rome on 4 and 5 April 2017 (see annex 11), and additional changes and adaptations will

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<sup>1</sup> GSARS, 2016.

<sup>2</sup> See: GSARS, 2017.

<sup>3</sup> For the links between the proposed WSM and the Sustainable Development Goals, see Annex 1 and 3 of the *Technical Report 2*.

be implemented after the planned field tests. The final version of the guidelines on how to incorporate the WSM into existing household surveys – the final product of the project – will include all the mentioned changes.

The following sections are structured as follows:

Section 1 includes an overview of the short and the long form of the WSM. In section 2, methodological issues related to data collection, such as the measurement of variables, the choice of a suitable recall period and sampling strategies, are discussed. Suggestions on how to incorporate the WSM into different types of household surveys are provided in section 3, while the woodfuel indicators that can be derived from the collected data are described in section 4. The main limitations and the steps forward of the project are discussed in section 5.

# The Woodfuel Supplementary Module

The short form of the WSM presented in annex 2 collects data on the main aspects of woodfuel consumption and production at the household level, such as:

Sections 1 and 2: fuelwood and charcoal use, acquisition and sales

- (a) Quantities of fuelwood and charcoal consumed by the household, by type of use;
- (b) Monetary expenditure on fuelwood and charcoal;
- (c) Quantities of fuelwood and charcoal collected or produced by household members;
- (d) Time spent producing fuelwood and charcoal, and household members involved;
- (e) Quantities sold and income derived from fuelwood and charcoal sales;

Sections 3 and 4: household fuel combustion and wood security

- (f) Conversion technology: type of charcoal kiln and type of cooking stove;
- (g) Location of stove and presence of windows, chimneys, extractors and fans.

The long form of the WSM builds on the short version (see annex 3); the main additions are the following:

Sections 1 and 2: fuelwood and charcoal use, acquisition and sales

- (a) The main wood species used as fuel and for charcoal production are investigated. For fuelwood, the enumerator is also asked to measure the humidity of wood with an electronic hygrometer.
- (b) Quantities of wood purchased by the household are sought - only monetary values are enquired about in the short version – and purchased wood is further disaggregated into direct and indirect wood.

- (c) In the “production” sections, the source of collected wood and of wood cut for producing charcoal is sought. Negative effects of woodfuel production on household members’ health and schooling are also investigated.
- (d) In the “sales” sections, the type of buyer of woodfuel is also sought.

Sections 3 and 4: household fuel combustion and wood security

- (e) In the “household fuel combustion” section, additional questions are asked about the occurrence of health problems because of fuel burning at home.
- (f) A fourth section on “wood security” is added, including questions on the occurrence of wood or charcoal shortages, the month in which they occurred and the consequences of such shortages on cooking or other domestic or productive activities.

As discussed in *Technical Report 2*, not all the questions listed above are to be included in all the selected surveys. Their inclusion will depend on the survey in which the WSM will be incorporated, and on country-specific circumstances. This and other methodological issues, such as how to weigh wood consumed by households, are discussed in details in sections 2 and 3. Finally, it is worth noting again that the population of interest is represented by the household sector and that consumption and production of woodfuel by non-household entities such as public facilities, enterprises and logging companies fall outside the scope of this project.

# 2

## Methodological Issues

### 2.1. Units of measurement and weighing procedures

Questions on consumption and production of woodfuel require the measurement of woodfuel weight, and hence the choice of a method to weigh wood and of a unit of measurement. In the literature, wood quantities were measured as follows:

- (a) In Brouwer & Falcão (2004), wood quantities were estimated for domestic and non-domestic consumers. For commercial activities, average monthly quantities of firewood consumed were measured in cubic meters, while charcoal quantities were measured in kilograms per month. The total wood biomass equivalent was expressed in cubic meter per year by using a conversion factor of 7.15 kg of wood for 1 kg of charcoal.<sup>4</sup> For domestic consumption, households were asked to declare the number of days per week woodfuel was used, the average daily consumption and the time, quantity and cost of the last woodfuel purchase. The unit of measurement used for charcoal was “bags”; this allowed for reliable estimates of quantities, given the standard size of charcoal bags. With regard to firewood, quantities were not weighed and were expressed in non-standard units of measurement. Therefore, quantities were indirectly estimated by dividing the daily average expenditure on firewood – available for all households – by the price per kg paid by 36 households of a control group. For those households, the wood consumed was actually weighed and registered during two 30-day periods – October 2000 and April 2001 – in order to take into account seasonality issues.
- (b) In Jarju (2008), 95 respondents were asked to report the number of bundles collected and used per day. To assess the weight of the bundles, a sample of 175 bundles was weighed on a calibrated weighing scale, in both urban and rural areas. Final estimates of biomass consumed per year were then expressed in cubic meters using a conversion factor of 668 kg/m<sup>3</sup>, based on the wood species declared by respondents and on previous studies on the densities of local wood species.
- (c) In Biran *et al.* (2004), firewood consumption in a study site in Malawi was monitored monthly over a period of seven consecutive days in sixty

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<sup>4</sup> Based on Joaquim (2004) and on an average specific weight of 650 kg/m<sup>3</sup> for the wood species used for charcoal production in the production areas surrounding Maputo (GRNB, 1999).

randomly selected households. On the first day, the household stockpile was weighed. On each of the seven days, the firewood bundles collected or bought by the household were weighed and an estimate of the weight of any wood that had been sold or donated to other households was recorded. The stockpile was then re-weighed at the end of the seventh day. In a study site in the United Republic of Tanzania, wood collectors of 60 households were followed continuously by an observer on two or three 11-hours sampling days each. Distance from wood source was measured using a pedometer. In both the cases in Malawi and the United Republic of Tanzania, the weight of the loads was measured in kilograms.

- (d) In Shackleton, Gambiza & Jones (2007), households were asked to report frequency of use, quantities, sources and the unit cost<sup>5</sup> of fuelwood. Households with a fuelwood pile at the homestead at the time of the interview were requested to set aside the amount of wood they typically used within a day, which was subsequently weighed using a spring balance<sup>6</sup> to the nearest 0.5 kg.
- (e) In Miah, Al Rashid & Shin (2009), data on the quantity of woodfuel used by households in Bangladesh were collected in local units such as cartloads, *auri*, *maund* and headloads.<sup>7</sup> Except *maund* – corresponding to 37 kg – the other units vary from Union to Union;<sup>8</sup> therefore, in every union an average value was taken for each unit of measurement.

A review of household surveys including questions on woodfuel was presented in *Technical Report 2*. Among the reviewed surveys, those containing questions on quantities of woodfuel were:

- (a) Nepal LSS 2010: Quantities of wood collected over the past 12 months were expressed either in kilograms or in local units such as *bhari* or carts; respondents had to provide a conversion factor to convert the latter two units into kg.<sup>9</sup>
- (b) Timor Leste LSMS 2006: Quantities of purchased fuelwood were expressed in kg and referred to the past month and the past year; quantities of fuelwood produced by the household over the past year were surveyed by using as a unit of measurement a “bunch of .04 cubic meters”.
- (c) Uganda NHS 2011-12: Quantities of purchased firewood and charcoal over the past 30 days were surveyed in kg, bundles or other units of measurement.

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<sup>5</sup> If purchased.

<sup>6</sup> For a description of spring scales, see: [https://en.wikipedia.org/wiki/Spring\\_scale](https://en.wikipedia.org/wiki/Spring_scale)

<sup>7</sup> Cartload: 700-1,000 kg; *auri*: 25-35 kg; headload: 20-25 kg.

<sup>8</sup> Union Councils (or Union Parishads or Rural Council or Unions) are the smallest rural administrative and local government units in Bangladesh.

<sup>9</sup> Conversion factors are also sought in the community questionnaire.

Conversion factors were not provided, but monetary values were investigated, allowing indirect estimates of a unit price of woodfuel per kg and to use this parameter to estimate quantities expressed in non-standard units of measurement from monetary values.

- (d) Uganda NHS 2012-13: Quantities and monetary values of firewood and charcoal were collected in a unit of measurement chosen by the respondents for the following categories of woodfuel: purchased; home produced; and received in-kind. Unit price was also recorded.

With regard to the survey-based woodfuel studies described in *Technical Report 2*, the following methodologies were adopted:

- (a) In CEPAL (2011), households that declared fuelwood as the main fuel for cooking were asked to provide the size, humidity, weight (in kg) and wood species of an average log, as well as the number of logs weighed at the beginning and at the end of a two-day observation period. Respondents also were required to indicate the average weekly consumption of wood, expressed in local units of measurement.<sup>10</sup> To convert those quantities into kg the number of logs per unit was to be provided.
- (b) In UNDP Cambodia (2008), scales were provided to enumerators to measure fuelwood samples; final figures were expressed in kg per household per month. Total quantities were then converted into energy content values, in order to forecast the energy demand satisfied by each type of fuel or source of energy.
- (c) In Bensel & Remedio (1993), enumerators were provided with portable weighing scales to make estimates of woodfuel consumption. Respondents were asked about: (a) frequency of purchase, delivery and production of fuelwood and charcoal, and (b) the amount purchased, delivered or produced each time. They were also asked to take measurements of representative units such as bundles of wood or packages of charcoal.

Based on this brief review, the method to weigh wood suggested in this report is the following:

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<sup>10</sup> Such as: *Carga* (load), *Carretada* (cart), *Tercio*, *Raja* and *Camionada*.

- a) to weigh fuelwood, respondents are asked to show the *usual bundle* consumed in a day for a given purpose, such as cooking. The bundle is then weighed by means of a spring scale provided to enumerators, obtaining measures expressed in kilograms or pounds. If fuelwood is used for multiple purposes, the bundle is weighed only once: quantities used for additional purposes are then asked in terms of number of bundles similar to the one just weighed.<sup>11</sup>
- b) to weigh charcoal, the procedure adopted is analogous: weight is measured by filling a “sack” provided to enumerators with the usual quantity consumed per day by the household for a given use. Quantities used for additional purposes are then quantified with reference to this representative sack.

In this way, a quite precise estimate of the quantity of woodfuel used by the household can be obtained without having to visit a household more than once or to ask respondents to arbitrarily estimate woodfuel amounts.

It is to be noted that measuring the amount of fuelwood consumed is not sufficient to measure the energy content of wood, as the calorific power of wood is heavily influenced by its water content.<sup>12</sup> In the long form of the WSM a specific question on water content is asked, while this question is not included in the short version. Questions about the length of the drying process of wood and the characteristics of the place where wood is stored<sup>13</sup> may be added to the questionnaire, with a view to indirectly estimate the water content.<sup>14</sup> Their inclusion, however, would significantly increase the length of the questionnaire and the burden on respondents. It is therefore advisable to only add those questions to stand-alone woodfuel surveys.

The solution proposed here is to include – only in the long form of the WSM – the measurement of wood humidity by means of an electronic hygrometer.

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<sup>11</sup> Values such as *one third, three quarters or two and a half* bundles are also allowed.

<sup>12</sup> The energy given off from a piece of wood is more or less the same on a weight basis irrespective of species – it is slightly higher in Coniferous species than in deciduous tree species - but it is heavily influenced by the moisture content, according to the formula:  $MJ/kg = \frac{100x - 2.4(54 + M)}{100 + M}$  where x = High Heat Value of wood and M = Moisture content.

<sup>13</sup> Such as: presence of a roof that covers from rains; of windows for ventilation; of isolation from the ground.

<sup>14</sup> According to Bittermann & Suvorov (2012) during the first year of storage the water content from fresh cut wood decreases from about 55 percent – with a net calorific value (NCV) of about 7.0 MJ/Kg for a firewood mixture of 50 percent deciduous and coniferous wood – to about 30 percent, and in the second year to about 20 percent – with a NCV of about, respectively, 12 and 14 MJ/kg.

## 2.2. Reference period and recall period

Another important aspect related to the measurement of woodfuel quantities is the selection of an adequate recall period.

In Moylan (2016) an interesting comparison was done to analyse the different results obtained in quantities of an agricultural crop because of the different recall periods adopted in several subsamples of respondents. Although related to cassava production, this methodological paper highlights the importance of the selection of an appropriate recall period to get good quantitative results.<sup>15</sup>

- (a) In Brouwer & Falcão (2004), the firewood consumed by a control group of 36 households was actually weighed and registered during two 30-day periods, one falling in the dry season – October 2000 – and one in the wet season – April 2001 – in order to take into account seasonality of consumption. The results showed a stable consumption of charcoal over time and a reduced consumption of firewood during the wet season due to reduced possibilities of transport, which made firewood less competitive compared to other available fuels.
- (b) In Jarju (2008) the survey was conducted between the months of October and December 1998; respondents were asked to estimate the weight in kg and the number of bundles collected per day.
- (c) In Shackleton, Gambiza and Jones (2007), given the anticipated strong peak in fuelwood demand during the cold winter months, use data were recorded separately for winter and summer. Winter was taken to be mid-May to mid-August – 15 weeks – and summer was therefore 37 weeks. Respondents were asked about the daily quantity used and the number of days per week woodfuel was burnt in both seasons.
- (d) In CEPAL (2011) quantities of charcoal were surveyed with reference to a representative month.
- (e) In Bensel & Remedio (1993), finally, the frequency of fuelwood collection was referred to an average month, while fuelwood and charcoal purchases were referred to an average week. Households were also asked about the average consumption of charcoal over an average week, and whether consumption levels changed during special occasions and different times of the year.

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<sup>15</sup> In particular, quantities registered by respondents on a diary and reported by phone to the enumerator were higher than the quantities obtained with a six-month recall period; the latter were similar to the quantities obtained through diary and enumerator's visit to respondents, and these, in turn, were higher than quantities obtained with a 12-month recall period.

In the proposed WSM, respondents are asked about the number of weeks and the number of days per week during which a usual daily quantity of woodfuel – measured with a spring scale – is actually consumed for a given purpose in the previous month (see annexes 2 and 3). The same scheme is adopted for woodfuel production. In this way, only one measurement is needed per household, without requiring a second visit in a different period of the year. To take into account seasonality of consumption and production, the sample of households should be accurately selected in order to cover the main seasons of the year (see section 2.5).

### 2.3. Local adaptations

When translating a questionnaire into different languages, cross-national harmonization of questions must be achieved. To carry out functionally equivalent translations, sophisticated techniques are required that take into account the syntactic, semantic and pragmatic levels of the source language questionnaire. Normally, two independent draft translations should be made per language, and a pre-test should be an integral part of the translation process (Brancato *et al.*, 2006).

In some countries, the questionnaire should be developed in more than one language because of the presence of significant minorities with their own languages.<sup>16</sup> Annex 10 provides an overview of the official and main languages spoken in each country of the regions of interest.

Other adaptations need to tailor the module to local specificities with regard to the names of stoves and kilns, the names of wood species and the names of months and seasons.

Questions on the types of cooking stoves and charcoal kilns used by households and small producers will contribute to estimate the efficiency of fuel conversion into energy. However, given the wide variety of stoves and kilns available globally, only a small number of them will be listed in the questionnaire. The selection will depend on the country under observation and be based on both literature review and interviews of key-informants to be completed prior to the

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<sup>16</sup> In Murphy (2009), for example, six languages, out of the more than 700 spoken languages in Papua New Guinea, were spoken in the area surrounding the villages under observation, where a seventh different local language was spoken. The questionnaire was therefore written in *Tok Pisin*, a fluid language adaptable to almost all the language groups of the country. Nonetheless, combined with tonal differences and accents, the written words of that language can take on different meanings depending on which language group the surveyor is from. The questionnaire development took as much as two years, and required the involvement of people from the coast, the highlands and the various islands.

field test.<sup>17</sup> Kammen & Lew (2005) conducted a review of charcoal kiln studies, including in the Appendix the kiln types used by countries, as summarized in table 2.1.

**Table 2.1: Major kiln types used in developing countries in Africa, Asia and Latin America.**

Type	Country(ies)	Type	Country(ies)
<b>Mound</b>		<b>Brick</b>	
Traditional	India, United Republic of Tanzania, Somalia	Siamese	Malaysia
Small circular	India	Nilgiri	India
Mozambique long	Mozambique	Standard Beehive	Brazil
Large Suriname	Mozambique	South African garage	South Africa
Casamance	Mozambique, Senegal	Commercial half-orange	Argentina
<b>Pit</b>		<b>Portable steel</b>	
Chinese	India, Sri Lanka	Trihan	India
Commercial brick	Sri Lanka	La Bastia	India
Philippines	Philippines	Mark V	Côte d'Ivoire, United Republic of Tanzania, Liberia
Improved	Liberia, South Africa	TPI	7 countries

*Source:* Author's elaborations on Kammen and Lew (2005).

With regard to the cooking stoves, the Global Alliance for Clean Cookstoves lists more than 300 different types of stoves in its online “Clean cooking catalogue”.<sup>18</sup> Other studies on stoves used in different countries are listed in annex 8.

The list included in the questionnaire will therefore have to be adapted to match local conditions. With a view to facilitating respondents in selecting the right type of stove, a “stove card” similar to the one adopted by the World Health Organization (WHO) can be provided to enumerators (see annex 9), along with a “kiln card” depicting the main types of charcoal kilns available in the country. For the computer-assisted personal interviewing collection mode (see section

<sup>17</sup> According to Smith *et al.* (1999), for example, the five main types of charcoal kilns used in Thailand are: (a) brick beehive; (b) mud beehive; (c) earth mound; (d) rice husk mound; and (e) single drum. In World Bank (1991) the “traditional” kilns used in Rwanda are earth pits and earth mounds, as opposed to the “improved” casamance kiln.

<sup>18</sup> See: <http://catalog.cleancookstoves.org/stoves>.

2.4) pictures of stoves and kilns can be shown to respondents from the enumerator's tablet, with a view to helping them to identify the type of stove or kiln used.

With regard to the plant species used as fuel, the only way to identify a plant species is by its scientific name. This is often unknown to the vast majority of respondents, however. Several local names may correspond to the same scientific name of a given plant, even within the same region of a country, making the identification of the plant used somewhat complicated. For this study, the wood species is asked through an open question, with no pre-coded answers. Respondents are asked to provide the local name of trees, which is “translated” into the respective scientific names by the enumerator based on information obtained through interviews to key-informants during the pre-test.

The names – and number – of months presented in the questionnaire have to undergo modifications, as well. In Nepal, for instance, where the Hindu *Vikram Samvat* calendar is adopted, months are not named as in the Gregorian calendar;<sup>19</sup> in addition, the number of months in a year can change over time,<sup>20</sup> the first month of the year is not the one corresponding to the Gregorian calendar's “January”, and the current year is 2073.

Local adaptations are required as far as names of seasons and of local currencies are concerned.

## **2.4. Data collection modes: Paper and Pencil Interviewing and Computer-Assisted Personal Interviewing**

In selecting an appropriate data collection mode, the following must be considered: the sensitiveness of the survey subject; the complexity of the questionnaire; the length of the interview; the characteristics of the target population; and the budget for the survey (Brancato *et al.*, 2006). The main data collection modes are shown in table 2.2.

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<sup>19</sup> The months of the Nepali calendar are: 1. Baishakh 2. Jesta 3. Ashadh 4. Shrawan 5. Bhadra 6. Ashwin 7. Kartik 8. Mangsir 9. Poush 10. Magh 11. Falgun 12. Chaitra

<sup>20</sup> This calendar uses lunar months and sidereal years, which do not match perfectly. Accordingly, correctional months might be added or subtracted.

**Table 2.2: Standard data collection mode.**

Technology	Type of administration	
	Interviewer Administration	Self-Administration
Computer-assisted data collection (CAPI)	CAPI*, CATI**	CASI***: WBS (or CAWI)****; EMS*****.
Paper and pencil interviewing (PAPI)	PAPI face-to-face interview	PAPI mail surveys

\* Computer-Assisted Personal Interviewing; \*\*: Computer-Assisted Telephone Interviewing; \*\*\* Computer-Assisted Self-Interviewing; \*\*\*\* Web Based Survey (or Computer-Assisted Web Interviewing); \*\*\*\*\* E-Mail Surveys.

Source: Author's elaborations on Brancato *et al.* (2006)

A self-interviewing mode, for instance, is more advisable when the subject treated is very sensitive. Computer-assisted interviews, on the other hand, are more advisable for complex questionnaires with numerous skipping rules and consistency controls and – because of the reduced amount of time needed for data entry and analysis – for surveys with a high frequency of data collections. The unavailability of technical equipment in the target population, however, may exclude some data collection modes – for example, computer-assisted telephone interviewing – from the list of feasible techniques; an insufficient budget, moreover, may limit the number of available choices. Also, computer-assisted telephone interviewing and computer-assisted self-interviewing modes are not advisable for very long questionnaires.

According to Caeyers, Chalmers & De Weerdt (2012), computer-assisted personal interviewing allows for a substantial reduction of errors compared to paper-and-pencil interviewing. As to the costs of the computer-assisted options, the prices of the required tablets start at about US\$60. Tablets, moreover, allows for collecting Global Positioning System (GPS) information, which is fundamental information for performing spatial analyses,<sup>21</sup> and for taking

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<sup>21</sup> For example: Wisdom model.

pictures.<sup>22</sup> Additional sensors can also be connected to the device, such as gas sensors – to estimate indoor air quality and the presence of pollutants such as carbon monoxide<sup>23</sup> – and portable wireless scales, to collect data on wood and charcoal weight.

As far as the WSM is concerned, the data collection mode will depend on the specific survey in which the module will be incorporated. As the questionnaire design is affected by the data collection mode, two different modules have been designed for each version<sup>24</sup> of the module: one for paper-and-pencil interviewing and one for computer-assisted paper interviewing. Annexes 2 and 3 include the paper-and-pencil interviewing version of the module.

Survey Solutions, a software developed by the World Bank, was used to develop the computer-assisted personal interview version. Among its main advantages are that it is easy to use and can be used free of charge, which makes it possible for anyone to build their own questionnaire and design their own survey with a tool freely available online, without the need to purchase a license. Survey Solutions also offers the possibility to store data either on the server of the World Bank or on other organizations' servers, and has a very helpful support website, which provides users with instructions and video tutorials. Data collected through the tablet can be exported in the most used formats compatible with software for data analysis, and the upload of photos and metadata is also possible (Rahija, 2016).

Other software for designing CAPI questionnaires and implementing surveys is also available.<sup>25</sup> To conduct woodfuel surveys through the proposed WSM, a possible alternative to the adoption of Survey Solutions is Collect Mobile, software freely downloadable from the Open Foris Platform<sup>26</sup> and developed by the Food and Agriculture Organization of the United Nations (FAO) and partners.<sup>27</sup> Collect Mobile is a data collection tool based on the Android operating system allowing the completion of complex data structures. Its main features include:

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<sup>22</sup> For example: the type of cooking stove or charcoal kiln used, in case this information is not easily recordable in the questionnaire.

<sup>23</sup> Although this item is not included in the WSM, it can be taken into consideration for further developments of the module.

<sup>24</sup> Short version and long version (see annexes 2 and 3).

<sup>25</sup> Among others: CSPro (by USAID), Blaise (by Statistics Netherlands), OpenDataKit (by University of Washington) and SurveyBee.

<sup>26</sup> See: [www.openforis.org](http://www.openforis.org).

<sup>27</sup> Resource partners: FAO; Ministry for Foreign Affairs of Finland; Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety of Germany; International Climate Initiative; and Norwegian Space Centre.

- (h) On-the-fly validation to improve data quality;
- (i) Geo-localization through an embedded Global Positioning System;
- (j) Handling of large lists of attributes;

Collect Mobile is also integrated with the software Collect – a tool for survey design and data management – and allows to export data into commonly used formats.

## 2.5. Sampling<sup>28</sup>

According to Hoekstra (1987), a stratification of the population on the basis of anticipated differences in the supply and demand of woodfuel may facilitate the selection of an appropriate sample in view of the analysis of the pattern of woodfuel supply and demand and the delineation of recommendations. A major criterion that is suggested for such stratification is the access to woodfuel sources by different users groups such as households, small enterprises, traders and public facilities.<sup>29</sup>

This recommendation is very useful for stand-alone woodfuel surveys but is not relevant for inclusion of a WSM into existing household surveys. In fact, for each survey a specific unit of observation and a specific sampling strategy are already established (see section 2.5.1) and hence the proposed stratification of the population cannot be performed.<sup>30</sup> Sampling is necessary, however, to extract a subsample of the surveyed households that will receive the WSM – or at least a set of its core questions – along with the main survey questionnaire, as discussed in section 2.5.2.<sup>31</sup>

### 2.5.1. Sampling strategies in existing household surveys

The Demographic and Health Survey (DHS) programme is designed for samples of 5,000 to 6,000 women aged 15 to 49. This sample size provides acceptable levels of sampling errors for key parameters, such as fertility and infant and child mortality. Typically, a sample of 1,000 women is needed for each geographical domain; hence the total sample size may be larger for countries where a greater number of domains is required. It is drawn using probability sampling with equal

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<sup>28</sup> For a general overview of sampling methods and of their implications on data analysis see annex 6.

<sup>29</sup> For example: by area of residence (urban vs. rural) or by type of user (households, public facilities, small enterprises and traders).

<sup>30</sup> For example: in household surveys the unit of observation is the household; in enterprise surveys the unit of observation is the enterprise.

<sup>31</sup> For a general overview of sampling, see annex 6.

probability of selection for each elementary unit, hence DHS samples are self-weighting. A DHS sample normally cover 100 percent of the population in the surveyed country.<sup>32</sup> A practical sample design developed for the DHS is the following. First, a standard segment size is adopted, typically 500 people according to the sampling frame. Every aerial unit in the country is then assigned a measure of size equal to the number of standard segments it contains, by dividing the population of the aerial unit by 500 and rounding to the nearest whole number. A sample of aerial units is then selected with probability proportional to size. In the selected aerial units that have a size greater than 1, a mapping operation is carried out to create the designated number of segments and one of these is selected at random. In the selected segments, all households or dwellings are listed, and a fixed fraction of them is selected by systematic sampling. In each selected household, finally, a household questionnaire is completed to identify women aged 15 to 49, all of whom are eligible to be interviewed (Macro International, 1996).

The Multiple Indicator Cluster Survey (MICS) adopt a two-stage sampling with population censuses as sampling frames. In the first stage census enumeration areas are selected with a probability proportional to size.<sup>33</sup> Then, household listing is carried out in selected enumerator areas or segments. In the second stage households are selected systematically from listing, without allowing for replacement.

The Living Standards Measurement Study (LSMS) surveys also use stratified cluster samples selected in two or more stages.<sup>34</sup> Stratification is done by region, district or rural and urban area, depending on the country. The number of households selected per cluster generally does not exceed 20 units.

The sample of the International Labour Organization (ILO) labour force surveys is typically based on a two-stage stratified random cluster design, although in some countries three stages or systematic sampling are adopted. Rotation patterns are also established in some countries, where a country-specific share of sampled households is replaced every quarter.<sup>35</sup> Twelve to twenty households are selected in each cluster, although the number may vary by country. The sampling frame is generally the population census.

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<sup>32</sup> When certain areas of a country must be excluded, they should constitute a coherent domain.

<sup>33</sup> Size is measured in terms of population of each enumerator area.

<sup>34</sup> For example: area units in the first stage; households in the last stage.

<sup>35</sup> For instance: 20 percent of sampled households are replaced every quarter, implying that every selected household remains in the survey for five consecutive quarters.

Comprehensive Food Security and Vulnerability Analysis (CFSVA) surveys typically use a stratified two-stage cluster sample. First, strata are defined on a geographic basis;<sup>36</sup> then, about 25-30 clusters are selected in each stratum;<sup>37</sup> finally, a fixed number of households – generally between 8 and 20 – is selected within each cluster. In general, two separate geographic stratification systems are used simultaneously, such as administrative boundaries and livelihood or agro-ecological zones.<sup>38</sup> Cluster sampling in the Comprehensive Food Security and Vulnerability Analysis (CFSVA) always uses a probability-proportional-to-size selection of clusters.<sup>39</sup> This ensures that all households, whether from a small or a big village, have an equal probability of being selected. Within each village, households are selected using simple random sampling (WFP, 2009). Often the “rule of thumb” size of 200-300 households per reporting domain is applied. A minimum of 25 clusters is selected per stratum, and between 10 and 15 households are sampled in each cluster.

Other national household surveys use survey-specific and country-specific types of sampling. A case-by-case description of the sampling designs used in each national household survey falls beyond the scope of this report, hence only a couple of surveys are described. In the Brazilian Pnad continua,<sup>40</sup> the sample is taken from a master sample that is used also for other surveys.<sup>41</sup> Every quarter, more than 200,000 private housing units are surveyed in about 16,000 areas distributed among approximately 3,500 municipalities. Also the South Africa General Household Survey shares a master sample with other national surveys.<sup>42</sup> Its sample is built with two-stage stratified design, with probability-proportional-to-size sampling of primary sampling units and systematic sampling of dwellings from the sampled primary sampling units.

## 2.5.2. Selection of a subsample of households that will receive the Woodfuel Supplementary Module

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<sup>36</sup> Stratification can also be performed by population groups such as livelihood groups, gender and wealth groups. Lack of data, however, makes this almost always impossible. Geographical stratification is, therefore, the best option, also because information related to food security and vulnerability is most often found for administrative aggregations or agro-ecological zones (WFP, 2009).

<sup>37</sup> Generally villages or refugee camps.

<sup>38</sup> This satisfies both the administrative stratification and a food security zone stratification. Accordingly, the analysis can provide aggregates for both stratifications.

<sup>39</sup> This means, for instance, that a village with 500 households is five times more likely to be selected than a village of 100 households.

<sup>40</sup> Continuous National Household Sample Survey – Quarterly Edition. See:

[www.ibge.gov.br/english/estatistica/indicadores/trabalhoerendimento/pnad\\_continua/](http://www.ibge.gov.br/english/estatistica/indicadores/trabalhoerendimento/pnad_continua/).

<sup>41</sup> A master sample frame is one in which the frame is used to select samples either for multiple surveys, each with different content, or for use in different rounds of a continuing or periodic survey (Turner, 2003).

<sup>42</sup> GHS. See: <http://www.ilo.org/surveydata/index.php/catalog/1278/sampling>.

Measuring woodfuel quantities requires the purchase, transport and use of scales, training of interviewers, and hence additional costs and time. Accordingly, it will not happen at the scale of several thousand interviews in each country. An appropriately selected sub-sample will therefore be extracted from the sample of surveyed households for inclusion of the WSM.

In the case of two-stage stratified cluster sampling – like in most of the surveys discussed in the previous section – a fixed proportion of the sampled households in selected clusters will receive the WSM within the survey questionnaire. The minimum required sample size ( $n$ ) is obtained with the following formula (see also annex 6):

$$n = \frac{D z^2 p (1 - p)}{d^2}$$

Where:

$D$  = Design effect;

$z$  = z-score corresponding to the chosen degree of confidence;<sup>43</sup>

$p$  = Estimated proportion of the key indicator, expressed as a decimal;<sup>44</sup>

$d$  = Maximum tolerable error (or: minimum desired precision), expressed in decimal form.<sup>45</sup>

The Design effect ( $D$ ,  $D_{eff}$ ,  $deff$ ) is often assumed to be equal to two, resulting in a doubling of the sample size requirement compared to the simple random sampling, but it varies by type of sampling and by indicator and can only be computed ex-post.

The value of  $p$  would correspond to the estimated share of households consuming woodfuel in a given country, whenever this estimate can be obtained from previous surveys or woodfuel studies. In cases in which no reasonably accurate estimate can be found, a default value of 50 percent should be used, as it will yield the larger sample size.<sup>46</sup>

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<sup>43</sup> 1.96 for degree of confidence of 95 percent; 2.576 for degree of confidence of 99 percent.

<sup>44</sup> For example: 20 percent = 0.20.

<sup>45</sup> For example:  $\pm 5\% = .05$ . Precision refers to the degree of error around the estimate due to the fact that the estimate is based on a sample.

<sup>46</sup> For a complete list of surveys and censuses already including questions on woodfuel consumption, see annexes 4-8 of *Technical Report 2*.

As to the value of d, according to Bittermann & Suvorov (2012) if woodfuel consumption in a country is low, it does not make sense to put a lot of efforts in good quality data, while an increased importance of woodfuel consumption creates a greater need for high quality data. Accordingly, three levels of importance are defined:

- Share of consumption greater than 30 percent: in this case the sampling error (with 95 percent confidence) should not exceed 3 percent; that means the maximum influence of that error on the reported share is  $> \pm 0.9$  and  $< \pm 3$  percent.
- Share of consumption between 10 percent and 30 percent: the sampling error (with 95 percent confidence) should not exceed 10 percent; that means the maximum influence of that error on the reported share is  $\pm 1$  to  $\pm 3$  percent.
- Share of consumption lower than 10 percent: the sampling error (with 95 percent confidence) should not exceed 30 percent; that means the maximum influence of that error on the reported share is  $< \pm 3$  percent.

It should be noted that the minimum required sample size should be calculated for each domain, namely for each geographic stratum for which an estimate will be produced in the final report. This should be carefully considered when planning the survey, as an increase in the number of domains results in an increase in the minimum required sample size.

In line with the objectives of the WSM, the subsample should allow for deriving estimates at the national and rural-urban domains. For example, assuming a design effect equal to 2 and a z-score of 1.96, suppose that the estimated share of households consuming woodfuel in rural areas of a given country is 40 percent while in urban areas is 15 percent. The maximum tolerable error would be 3 percent and 10 percent, respectively, and the minimum required sample size would be 2,048 households in rural areas and 98 households in urban areas, for a total of 2,146 households in the country. In cases in which cluster sampling is adopted, however, the sample size of each stratum should be a multiple of the number of observations in each cluster.

Deriving significant woodfuel statistics for geographic aggregations lower than urban and rural areas would of course be the ideal situation, but this implies a higher number of interviews and hence increased costs. In the first stage of implementation of the WSM, a disaggregation by urban and rural areas is deemed sufficient for analysis purposes.

It is worth noting that, because woodfuel consumption is affected by climatic conditions, the sub-sample should include clusters from different regions and elevation classes and – in case the survey period elapses along an entire year – households surveyed in different seasons.

The final sample size is affected by non-response. If, for instance, a 90 percent rate of response is expected,<sup>47</sup> then the sample size will have to be adjusted by 1.10 (Tango, 2007). With reference to the example shown above, this implies a final sample size of  $2,146 \times 1.1 = 2,361$  households.

## 2.6. Other issues

A good quality questionnaire and an appropriate data collection mode are necessary but not sufficient tools for obtaining reliable data; equally important is talking to an appropriate respondent. As a general rule, the respondent should be an adult member of the household – not a guest – and preferably the household head, or the head’s spouse. With regard to the WSM, the selected respondent should be the household member who is knowledgeable about woodfuel consumption – for example, the main cook – or production – the main collector of fuelwood.

Other key-factors for gaining respondents’ collaboration and collecting reliable data are the training of enumerators and pre-survey publicity.<sup>48</sup> Enumerators should not show up unannounced and demand information, as that approach is likely to be unsuccessful (WFP, 2009). Community leaders and officials should be contacted and informed about the purpose of the research, the procedure for selection, the subject to be covered and assured about confidentiality and anonymity of information. Enumerators should also briefly explain to the respondents the purpose of their study, the expected duration of the interview, how the results will be used, in order to reduce non-response rate and the likelihood of inaccurate answers (WFP, 2009). Questions must be asked carefully, making sure that the respondents have understood them correctly and the answer recorded is the one intended. Interviews should be conducted in private, and the place and timing of the interview should meet the respondent’s needs. These may change in urban and rural contexts, and by the sex of the respondent.

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<sup>47</sup> Due to, for example, absence of respondent, inability of respondent to complete the interview or refusal to participate in the survey.

<sup>48</sup> These aspects will be discussed in more details in the forthcoming *Technical Report 4*.

# How to Integrate the Woodfuel Supplementary Module into existing National Surveys

The WSM is not intended to be a fixed set of questions to be included in all types of surveys with the same modalities. Some questionnaires, such as those used for the MICS and the DHS, only include the questions that are more relevant to the objectives of the survey, while other surveys – mainly the LSMS and the CFSVA surveys – are eligible for inclusion of the entire set of the WSM questions in the respective questionnaires. Even in the latter case, however, the module needs to be adapted to the visual design and the structure of each questionnaire. The approach followed, therefore, is a flexible one, allowing for variations in the flow of questions without affecting the comparability of the gathered data.

## 3.1. Multiple Indicator Cluster Surveys

The household questionnaire of the sixth round of the MICS,<sup>49</sup> developed in December 2016, already includes a household Energy Use module. It has questions on: (a) the main cookstove used for cooking, the presence of a chimney or a fan, and the type of energy or fuel used; (b) the place where cooking is done; (c) the type of heating system, the presence of a chimney and the type of fuel used; and (d) the main source of light used by the household. The questionnaire for children age 5-17 contains, in the Child Labour section, inquiries about: (a) children's involvement and time spent in collecting firewood; and (b) involvement in other family activities, among which cooking, and total time spent in those activities (see annex 4). These questions provide a wide range of data on woodfuel consumption and production at the household level. The Energy Use module can hence be used as a benchmark for inclusion of a woodfuel module in similar surveys, such as the DHS.

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<sup>49</sup> Available at: <http://mics.unicef.org/tools>.

Additional questions that could be added in future rounds of the MICS are shown in tables 3.1 to 3.6. In particular, in the Household Characteristics section, a question on the involvement of household members in collecting firewood or producing charcoal could be added between questions HC18 and HC 19 (see table 3.1).

The advantage of introducing this new question is twofold. First, questions about firewood collection are only asked in the child labour section of the children questionnaire, but not in the questionnaires directed for men and women. This means that, in cases in which children are not involved in firewood collection, this activity would not be surveyed for that household, underestimating the household involvement – and especially that of women – in this activity. The second advantage is that only firewood collection is mentioned in the children questionnaire, but not the production of charcoal.

**Table 3.1. Questions that could be added in the Household Characteristics section of the sixth round of the MICS.**

<b>HC15.</b> Does any member of this household own any land that can be used for agriculture?	YES ..... 1 NO ..... 2	2 $\Rightarrow$ HC17
<b>HC16.</b> How many hectares of agricultural land do members of this household own? [OMITTED]	[OMITTED]	
<b>HC17.</b> Does this household own any livestock, herds, other farm animals, or poultry?	YES ..... 1 NO ..... 2	2 $\Rightarrow$ HC19
<b>HC18.</b> How many of the following animals does this household have? [OMITTED]	[OMITTED]	
<b>HCnew</b> Does any member of this household: [A] Collect firewood? [B] Produce charcoal?	YES    NO FIREWOOD ..... 1    2 CHARCOAL..... 1    2	
<b>HC19.</b> Does any member of this household have a bank account?	YES ..... 1 NO ..... 2	

A question on how the household warms up water used for purposes other than drinking can also be added in the water and sanitation module after question WS2 (see table 3.2). Alternatively, this question could be added at the end of the Energy Use module and linked to question WS10 about the way in which water is sterilized – boiling is listed as one of the possible options. The set of questions WS3 to WS9, moreover, could be adapted to investigate firewood collection in the energy use section, as shown in table 3.3.

**Table 3.2. Questions that could be added in the Water and Sanitation section of the sixth round of the MICS.**

<b>WS2.</b> What is the <u>main</u> source of water used by members of your household for other purposes such as cooking and handwashing?  [Omitted]	<b>PIPED WATER</b> PIPED INTO DWELLING .....11 PIPED TO YARD / PLOT .....12 PIPED TO NEIGHBOUR .....13 PUBLIC TAP / STANDPIPE .....14  [OMITTED]	11⇒WS7 12⇒WS7
<b>WSNEW</b> What does your household <u>mainly</u> use for warming water when needed?	THREE STONE STOVE/OPEN FIRE .....11 COOKING STOVE .....12 ELECTRIC BOILER .....13 GAS BOILER .....14 SOLAR ENERGY .....15 OTHER .....16 NO WARMING .....17	

**Table 3.3. Questions of the Water and Sanitation section of the sixth round of the MICS that could be adapted to woodfuel and included in the Energy Use section.**

CURRENT VERSION Water and Sanitation (WS) module	PROPOSAL Inclusion of similar questions in the EU module
<b>WS3.</b> Where is that water source located?	<b>HCnew.</b> Where is that source of firewood located?
<b>WS4.</b> How long does it take for members of your household to go there, get water, and come back?	<b>HCnew.</b> How long does it take to go there, get firewood, and come back?
<b>WS5.</b> Who usually goes to this source to collect the water for your household?	<b>HCnew.</b> Who usually goes to this source to collect firewood for your household?
<b>WS6.</b> Since last ( <i>day of the week</i> ), how many times has this person collected water?	<b>HCnew.</b> Since last ( <i>day of the week</i> ), how many times has [name] collected firewood?
<b>WS7.</b> In the last month, has there been any time when your household did not have sufficient quantities of drinking water?	<b>HCnew.</b> In the last month, has there been any time when your household did not have sufficient quantities of firewood or charcoal?
<b>WS8.</b> What was the main reason that you were unable to access water in sufficient quantities when needed?	<b>HCnew.</b> What was the main reason that you were unable to access firewood or charcoal in sufficient quantities when needed?
<b>WS9.</b> Do you do anything to the water to make it safer to drink?	<b>HCnew.</b> Which of the following activities were affected by such shortages? COOKING FOOD ..... 11 HEATING SPACE ..... 12 LIGHTING..... 13 OTHER DOMESTIC USES ..... 14 AGRICULTURAL USES ..... 15 COMMERCIAL USES ..... 16 RELIGIOUS, CULTURAL USES ..... 17

The questions proposed above could also be added in the Household Characteristics section, after the new question on the involvement in woodfuel production proposed in table 3.1.

Another question that could be added at the end of the Energy Use module is about the fuel used by the household for agricultural, commercial or cultural purposes.

**Table 3.4. Additional question that could be added in the Energy Use section of the Household Questionnaire.**

<b>EUnew.</b> What fuel does your household <u>mainly</u> use for the following purposes? [A] Agricultural activities [B] Commercial activities [C] Cultural uses, religious rituals	AGRICULTURAL ACTIVITIES ..... _____ COMMERCIAL ACTIVITIES..... _____ CULTURAL, RELIGIOUS USES ..... _____
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In the Child Labour section of the questionnaire for children age 5-17, a question on children's involvement in charcoal production could be added after the questions CL9 and CL10, which are related with children's involvement in the collection of firewood. Also, negative effects of such activities on schooling and health could be sought:

**Table 3.5. Woodfuel questions that could be added in the Child Labour section of the sixth round of the MICS.**

<b>CL9.</b> Since last ( <i>day of the week</i> ), did ( <i>name</i> ) collect firewood for household use?	YES..... 1 NO ....., 2	2 $\Leftrightarrow$ CL11
<b>CL10.</b> In total, how many hours did ( <i>name</i> ) spend on collecting firewood for household use, since last ( <i>day of the week</i> )? <i>If less than one hour, record '00'.</i>	NUMBER OF HOURS .....	
<b>CLnew.</b> Since last ( <i>day of the week</i> ), did ( <i>name</i> ) helped to produce charcoal for household use or for sale?	YES..... 1 NO ....., 2	2 $\Leftrightarrow$ CL13
<b>CLnew.</b> In total, how many hours did ( <i>name</i> ) spend on producing charcoal for household use or for sale, since last ( <i>day of the week</i> )? <i>If less than one hour, record '00'.</i>	NUMBER OF HOURS .....	

<b>CLnew</b> Did [name]'s involvement in firewood collection or charcoal production have any of the following negative consequences?	MISSED SCHOOL DAYS..... 11 SCHOOLING PROBLEMS..... 12 INJURIES, ILL HEALTH..... 13 ASSAULTS, VIOLENCE..... 14 OTHER..... 15 NO NEGATIVE CONSEQUENCES..... 16	
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In the same section, question CL13 inquires the amount of time dedicated to different home activities listed in question CL11, including cooking. A separate question about cooking should be asked, however, with a view to allow for disaggregating the results for this activity<sup>50</sup> that may have negative effects on children's health in case of inefficient fuel combustion.

**Table 3.6. Additional questions that could be added in the CL section.**

<b>CLnew</b> Did fuel combustion cause any of the following health problems to [name] while cooking or performing other domestic activities?	HEADACHES, NAUSEA ..... 11 SKIN/EYE IRRITATIONS ..... 12 SNEEZING NOSE, ALLERGY, ASTHMA ..... 13 BURNS, OTHER INJURIES ..... 14 NO HEALTH PROBLEMS..... 15	
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Questions pertaining to firewood and charcoal production should also be in the questionnaire for women.

After the introduction of the proposed questions into the MICS questionnaires, an even more complete picture of the household use of woodfuel, of its members' involvement in woodfuel production and of the effects this has on health and schooling could be obtained. What will be still missing is mainly the quantity of woodfuel consumed and produced, the monetary values of woodfuel purchases and sales, and the type of kiln used for making charcoal. These issues, however, fall beyond the scope of the MICS and should not be included in its questionnaire.

<sup>50</sup> The questionnaire currently includes a question on the total amount of time spent for all the listed activities.

### **3.2. Demographic and Health Surveys**

As described in Technical Report 2, the Household Questionnaire of round 7 of the DHS contains three questions related to the type of fuel used for cooking and the place where cooking is done.<sup>51</sup> The inclusion of an energy use module, such as the one described in the previous paragraph is therefore advised; it could be placed between the “Household Characteristics” and the “Mosquito Nets” modules of the household questionnaire, collecting information on the type of fuel, location and technology used by the household not only for cooking but also for heating space, lighting, agricultural and commercial activities and cultural or religious purposes (see table 3.4).

Additional questions should also be added in the Household Characteristics section. In particular, questions on the production of woodfuel could be added after question 120, following the set of questions on livestock rearing and agricultural land, as shown in table 3.7.

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<sup>51</sup> Available from: <http://dhsprogram.com/publications/publication-dhsq7-dhs-questionnaires-and-manuals.cfm>.

**Table 3.7. Additional questions that could be added in the “Household Characteristics” section of round 7 of the DHS.**

120	How many hectares of agricultural land do members of this household own?  IF 95 OR MORE, CIRCLE '950'.	HECTARES ..... <input type="text"/> . <input type="text"/>  95 OR MORE HECTARES ..... 950  DON'T KNOW ..... 998	
new	Does any member of this household:  a) Collect firewood?  b) Produce charcoal?	a) YES <input type="checkbox"/> NO <input type="checkbox"/>  b) YES <input type="checkbox"/> NO <input type="checkbox"/>	
new	Where is the source of fuelwood located?	OWN FARM.....01 ROADSIDE, VILLAGE OR URBAN AREA.....02 DUMP, CONSTRUCTION SITE, OWN DWELLING.....03 NATURAL FOREST.....04 FOREST PLANTATION..... 05 RIVER BANKS, BUSH, OTHER WOODED LAND.....06	
new	How long does it take to go there, take firewood and come back, in hours?	HOURS ..... <input type="text"/> <input type="text"/>	
new	Who usually:  a) Collects firewood?  b) Produce charcoal?		
New	Since last [DAY OF THE WEEK] how many times has [NAME]:  a) Collected firewood?  b) Produced charcoal?	TIMES ..... <input type="text"/> <input type="text"/>  TIMES ..... <input type="text"/> <input type="text"/>	

**Table 3.7. (Cont'd)**

new	In the past month, was firewood or charcoal not available for at least one full day?	a) FIREWOOD ..... b) CHARCOAL .....	Yes 1 1	No 2 2	
new	What was the main reason of the lack of woodfuel?	a) UNAVAILABILITY ..... b) LACK OF MONEY ..... . . c) OTHER (SPECIFY) .....	Yes 1 1 1	No 2 2 2	
New	Which of the following activities were affected by woodfuel shortages?	a) COOKING ..... . . b) HEATING SPACE..... c) LIGHTING ..... . . d) OTHER DOMESTIC USES ... . . e) AGRICULTURAL USES ..... f) COMMERCIAL USES ..... . . g) RELIGIOUS, CULTURAL USES . .	Yes 1 1 1 1 1 1	No 2 2 2 2 2 2	
121	Does your household have:  Electricity? A radio? A television? A non-mobile telephone? A computer? A refrigerator?  [ADD ADDITIONAL ITEMS. SEE FOOTNOTE 7]	a) ELECTRICITY ..... . . b) RADIO ..... . . c) TELEVISION ..... d) NON-MOBILE TELEPHONE .. . . e) COMPUTER ..... . . f) REFRIGERATOR .....	Yes 1 1 1 1 1	NO 2 2 2 2 2	

Alternatively, these questions could be added in the section “Additional Household Characteristics”, at the end of the household questionnaire.

Similarly to what is proposed for the MICS, a question about the warming of water could be added either in the Household Characteristics section – after question 103, as shown in table 3.8 – or in the Additional Household Characteristics section – between questions 141 and 142.

A Child Labour section is not included in any questionnaire<sup>52</sup> of the round 7 of the DHS. Questions on the amount of time dedicated to cooking and the effects of household fuel combustion on members’ health (see table 3.6) could hence be

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<sup>52</sup> The survey questionnaires are: Household Questionnaire, Woman’s Questionnaire, Man’s Questionnaire, Biomarker Questionnaire, and Fieldworker Questionnaire.

included in the Woman's Questionnaire, either in section 6 – Child Health and Nutrition – or in section 11 – Other health Issues.

**Table 3.8. Additional question that could be added in round 7 of the Multiple Indicator Cluster Survey DHS.**

new	What does your household mainly use for warming water when needed?	THREE STONE STOVE/OPEN FIRE ..... 1 COOKING STOVE ..... 2 ELECTRIC BOILER ..... 3 GAS BOILER ..... 4 SOLAR ENERGY ..... 5 OTHER ..... 6 NO WARMING ..... 7
102	What is the main source of water used by your household for other purposes such as cooking and handwashing?	<b>PIPED WATER</b> PIPED INTO DWELLING ..... 11 PIPED TO YARD/PLOT ..... 12 PIPED TO NEIGHBOR ..... 13 PUBLIC TAP/STANDPIPE ..... 14 <b>TUBE WELL OR BOREHOLE</b> ..... 21 [OMITTED]
103	Where is the water source located?	IN OWN DWELLING ..... 1 IN OWN YARD/PLOT ..... 2 ELSEWHERE ..... 3

### 3.3. Living Standard Measurement Study and similar surveys

As discussed in *Technical Report 2*, the LSMS and the CFSV are the two types of survey most suitable for inclusion of the entire set of questions of the woodfuel supplementary module. An interesting feature of LSMS is that questions can be incorporated not only in the Household questionnaire, but also in the Agriculture, Fishery and Community questionnaires, provided that they are part of the survey material. The following subsections describe how to include the questions of the woodfuel module in each type of questionnaire.

#### 3.3.1. Household questionnaire

Ecuador is one of the countries considered for the field test; its Encuesta de Condiciones de Vida is a comprehensive household survey that have been conducted many years. The questionnaire of the sixth round of Encuesta de Condiciones de Vida (2013-14) already included some questions related with woodfuel consumption and household fuel combustion:<sup>53</sup>

- In section 1 part A “Characteristics of the dwelling” questions are asked about the type of fuel used for cooking – wood/charcoal is one of the answer categories – and the type of kitchen;
- In section 10, part B “Monthly expenditure”, expenditure on wood and charcoal are queried.
- In section 13, part C “Forestry activities”, questions 1 to 4 enquire about the value of sales of wood cut by the household, and the estimated monetary value of self-consumed wood.

Some sections of the questionnaire did not include questions specifically related to woodfuel, but enquired socio-economic aspects that are also queried in the WSM:

- Section 3, part C: questions about health and illnesses for all household members.
- Section 4: time use;
- Section 5, part B: reasons for not attending school;
- Section 12, part C: fuels used for commercial activities of the household.

The questions of the WSM – short form – can be introduced in the Encuesta Condiciones de Vida as follows:

- Questions 1 and 15 – about consumption of fuelwood and charcoal – can be introduced in section 1-A (Characteristics of the dwelling), after question 13 about cooking;
- Questions 28 and 29 – about stoves and heaters – can also be introduced in section 1-A to complement the information collected through the existing questions. Alternatively, these questions may be put into section 10-D (Equipment).
- Questions 2 to 5 and 16 to 19 – about purchases of fuelwood and charcoal - can be introduced in section 10-A (Expenditure), sub-section IV (non-food expenditures).

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<sup>53</sup> Available at: [www.ecuadorencifras.gob.ec//documentos/web-inec/ECV/Fomulario\\_Encuesta\\_Condiciones\\_de\\_Vida.pdf](http://www.ecuadorencifras.gob.ec//documentos/web-inec/ECV/Fomulario_Encuesta_Condiciones_de_Vida.pdf) (Accessed: 17 March 2017).

- Questions 6 to 14 – Collection and sales of fuelwood – and questions 20 to 27 – Production and sales of charcoal can be incorporated in Section 13-C “Forestry Activities”.

The additional questions of the long form of the WSM can be introduced in the questionnaire of the Encuesta de Condiciones de Vida as follows:

- Question 2 – about wood species and humidity – can be introduced in Section 1-A (Characteristics of the dwelling) along with the questions on quantities used;
- Questions 13 and 32 – about the source of wood – questions 20 and 39 – about the buyers of woodfuel – and questions 16 and 35 – about negative consequences of woodfuel production on household members – can be added in Section 13-C “Forestry Activities”;
- Questions 42 and 43 – about consequences on health of household fuel combustion – can be introduced in section 3-B (Presence of illnesses).
- Questions 44 to 46 – about wood security – can be introduced in section 10-A, after the questions of the sub-section III (Food security).

An alternative approach could be to introduce the entire set of questions of the WSM into an Energy Use module like the one included in the Uganda National Panel Survey 2011/12 and described in annex 5. Another option is to use a “mixed” approach, with questions on quantities of woodfuel consumed and type of stove included in a one-page module, and other questions included in the relevant sections of the survey questionnaire.

### **3.3.2. Community and facility questionnaires**

The Rural Community Questionnaire of the Nepal Living Standard Survey 2010-11 contains some questions related to wood and more generally to forests, especially in section 3 – part F (see table 3.9).<sup>54</sup> This questionnaire can be used as a reference for including questions on woodfuel in other countries’ community questionnaires.

Questions in red are the new ones proposed; they are mainly related to the causes of reductions in forest cover, legal issues about charcoal production and average price paid to charcoal producers in the community. The latter information, along with the question on the existence of forestry user groups,<sup>55</sup> is very important for analysing the charcoal value chain in a country. Alternatively, a question on the price paid to producers of charcoal and fuelwood could be added in section 8,

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<sup>54</sup> Available at: [http://catalog.ihsn.org/index.php/catalog/2138/related\\_citations](http://catalog.ihsn.org/index.php/catalog/2138/related_citations).

<sup>55</sup> Included in section 4 – part B - User Groups of the Nepal 2010 Community Questionnaire.

part D – Sale of crops – of the community questionnaire. In part E of the same section, conversion factors for locally adopted units of measurement are also sought.<sup>56</sup>

Additional questions on “wood security” such as those introduced in table 3.15 can also be added in the community questionnaire after question 36 (see table 3.9). Similarly, some of the questions included in the household questionnaire, such as the type of kiln used, the wood species most commonly used as fuel in the community and the average quantity of wood needed to produce a given amount of charcoal, can be moved to the community questionnaire, with a view to reduce the burden on respondents.

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<sup>56</sup> Conversion of local units.

**Table 3.9. Additional question on forests and woodfuel that can be added in the community questionnaire of the LSMS surveys, based on the Nepal LSMS 2010-11.**

### Section 3 Agriculture and forestry

### PART F: FORESTRY

28	Do the people in this ward have any community forests?	33	Has the time taken to collect an 'average bhari' increased/decreased/remained the same over the past 5 years for the people in this ward?																														
	<u>YES</u> 1 <hr/> <u>NO</u> 2 <hr/>		<u>INCREASED SUBSTANTIALLY</u> 1 <hr/> <u>INCREASED A LITTLE</u> 2 <hr/> <u>DECREASED A LITTLE</u> 3 <hr/> <u>DECREASED SUBSTANTIALLY</u> 4 <hr/>																														
new	What is the share of community land area covered by community forests?																																
new	What is the share of community members involved in forestry activities?																																
29	What is the most commonly used cooking fuel for households in this ward?	34	Have trees been planted in this area in the past 5 years? (A) PRIVATELY																														
	<table border="0"><tbody><tr><td><u>WOOD</u></td><td style="text-align: right;">1</td><td>FIRST</td></tr><tr><td><u>COW DUNG</u></td><td style="text-align: right;">2</td><td></td></tr><tr><td><u>LEAVES/RUBBISH/STRAW/THATCH</u></td><td style="text-align: right;">3</td><td></td></tr><tr><td><b>CHARCOAL</b></td><td style="text-align: right;">4</td><td>SECOND</td></tr><tr><td><u>COAL</u></td><td style="text-align: right;">5</td><td></td></tr><tr><td><u>GAS CYLINDER</u></td><td style="text-align: right;">6</td><td></td></tr><tr><td><u>ELECTRICITY</u></td><td style="text-align: right;">7</td><td></td></tr><tr><td><u>KEROSENE</u></td><td style="text-align: right;">8</td><td></td></tr><tr><td><u>BIO-GAS</u></td><td style="text-align: right;">9</td><td></td></tr><tr><td><u>OTHER</u></td><td style="text-align: right;">10</td><td></td></tr></tbody></table>	<u>WOOD</u>	1	FIRST	<u>COW DUNG</u>	2		<u>LEAVES/RUBBISH/STRAW/THATCH</u>	3		<b>CHARCOAL</b>	4	SECOND	<u>COAL</u>	5		<u>GAS CYLINDER</u>	6		<u>ELECTRICITY</u>	7		<u>KEROSENE</u>	8		<u>BIO-GAS</u>	9		<u>OTHER</u>	10		<u>YES</u> 1 <hr/> <u>NO</u> 2 <hr/>	(B) BY THE COMMUNITY
<u>WOOD</u>	1	FIRST																															
<u>COW DUNG</u>	2																																
<u>LEAVES/RUBBISH/STRAW/THATCH</u>	3																																
<b>CHARCOAL</b>	4	SECOND																															
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<u>ELECTRICITY</u>	7																																
<u>KEROSENE</u>	8																																
<u>BIO-GAS</u>	9																																
<u>OTHER</u>	10																																
			(C) BY THE GOVERNMENT																														
30	Where do most of people collect firewood?	35	Is charcoal production in community forests allowed/regulated/prohibited by the law?																														
	<table border="0"><tbody><tr><td><u>COMMUNITY MANAGED FOREST</u></td><td style="text-align: right;">1</td><td></td></tr><tr><td><u>GOVERNMENT FOREST</u></td><td style="text-align: right;">2</td><td></td></tr><tr><td><u>OWN LAND</u></td><td style="text-align: right;">3</td><td></td></tr><tr><td><u>OTHER</u></td><td style="text-align: right;">4</td><td></td></tr></tbody></table>	<u>COMMUNITY MANAGED FOREST</u>	1		<u>GOVERNMENT FOREST</u>	2		<u>OWN LAND</u>	3		<u>OTHER</u>	4		<table border="0"><tbody><tr><td><u>PROHIBITED</u></td><td style="text-align: right;">1</td></tr><tr><td><u>REGULATED</u></td><td style="text-align: right;">2</td></tr><tr><td><u>ALLOWED, NO RULES</u></td><td style="text-align: right;">3</td></tr><tr><td><u>OTHER</u></td><td style="text-align: right;">4</td></tr></tbody></table>	<u>PROHIBITED</u>	1	<u>REGULATED</u>	2	<u>ALLOWED, NO RULES</u>	3	<u>OTHER</u>	4											
<u>COMMUNITY MANAGED FOREST</u>	1																																
<u>GOVERNMENT FOREST</u>	2																																
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<u>REGULATED</u>	2																																
<u>ALLOWED, NO RULES</u>	3																																
<u>OTHER</u>	4																																
31	How far is the forest?	HOURS	What is the average price paid to charcoal producers of this ward?																														
	<b>RECORD ONE WAY WALKING TIME</b>																																
		MINUTES																															
32	Has the area under forests around the ward increased/decreased or remain the same over the past 5 years?	36	Over the past 12 months, was there a period in which it was difficult for households in this community to get enough wood?																														
	<table border="0"><tbody><tr><td><u>INCREASED</u></td><td style="text-align: right;">1</td></tr><tr><td><u>ABOUT THE SAME</u></td><td style="text-align: right;">2</td></tr><tr><td><u>DECREASED</u></td><td style="text-align: right;">3</td></tr></tbody></table>	<u>INCREASED</u>	1	<u>ABOUT THE SAME</u>	2	<u>DECREASED</u>	3																										
<u>INCREASED</u>	1																																
<u>ABOUT THE SAME</u>	2																																
<u>DECREASED</u>	3																																
new	What is the main reason for the reduction of forest cover?		If yes, during which months was it difficult for households in this community to get enough wood? Circle all that apply																														
	<table border="0"><tbody><tr><td><u>EXCESSIVE TIMBER PRODUCTION</u></td><td style="text-align: right;">1</td></tr><tr><td><u>EXCESSIVE WOODFUEL PRODUCTION</u></td><td style="text-align: right;">2</td></tr><tr><td><u>ILLEGAL CUTTING</u></td><td style="text-align: right;">3</td></tr><tr><td><u>WILDFIRES</u></td><td style="text-align: right;">4</td></tr><tr><td><u>OTHER</u></td><td style="text-align: right;">5</td></tr></tbody></table>	<u>EXCESSIVE TIMBER PRODUCTION</u>	1	<u>EXCESSIVE WOODFUEL PRODUCTION</u>	2	<u>ILLEGAL CUTTING</u>	3	<u>WILDFIRES</u>	4	<u>OTHER</u>	5																						
<u>EXCESSIVE TIMBER PRODUCTION</u>	1																																
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<u>ILLEGAL CUTTING</u>	3																																
<u>WILDFIRES</u>	4																																
<u>OTHER</u>	5																																

The average price of fuelwood in the community can also be investigated: the gathered information will make it possible to estimate fuelwood quantities purchased and sold when the quantities reported by respondents are not reliable or missing. Finally, two additional questions can be added in section 5 – Rural primary school – and section 6 – Rural health facility – to investigate the main fuel used for cooking and heating space in the schools and the health facilities of the community.

### 3.3.3. Agriculture and fishery questionnaires

In countries where Living Standards Measurement Study – Integrate Survey on Agriculture (LSMS-ISA) are implemented, specific questions on the use of woodfuel for agricultural purposes, or on the production of fuelwood in plots cultivated by the household, can be included in the Agricultural Questionnaire.

For example, in the agricultural questionnaire of the United Republic of Tanzania National Panel Survey 2012-13 questions on the quantity and use of the wood obtained from pruning fruit crops can be included in section 7a – Fruit crops. In section 7b – Permanent crops – questions on quantity and value of sold firewood from specialized woodlots are already included.<sup>57</sup> However, those values are referred to an aggregated category “303” that includes both firewood and fodder, while the two products should be disaggregated and identified by different codes. Questions on the quantities of woodfuel used for agricultural processes could then be added in section 10 – Processed agricultural products and agricultural by-products – of the agricultural questionnaire, and the type of kiln used to cure tobacco can also be investigated.<sup>58</sup>

Similarly, questions on the use of woodfuel for fish processing can be added in Fishery questionnaires in those countries where that module is part of the survey material.<sup>59</sup> In the Fishery Questionnaire of the Malawi Third Integrated Household Survey 2010/11, for instance, questions on the type of kiln used to smoke fish, the type of fuel used and its quantity and cost can be added in the section “Other costs” of module D – Fisheries Input (last high season) – and module H – Fishery Input (last low season), as shown in table 3.10.<sup>60</sup>

**Table 3.10. Additional question on woodfuel that could be added in the fishery questionnaire of LMSM surveys, based on the Malawi Third Integrated Household Survey 2010/11.**

<sup>57</sup> Available from: <http://microdata.worldbank.org/index.php/catalog/2252>.

<sup>58</sup> Such as: roasting coffee; curing tobacco; pasteurizing milk; preparing feed for animals; heating greenhouses, poultry-houses and swine-houses; drying tea, herbs and tapioca (see annex 2).

<sup>59</sup> For example: for smoking fish.

<sup>60</sup> Available from: <http://microdata.worldbank.org/index.php/catalog/1003>.

MODULE D: FISHERIES INPUT (LAST HIGH SEASON)

OTHER COSTS				
22. Have there been <u>other types of costs</u> related to fishing activities during the last HIGH fishing season? YES . 1 NO ..2 >> Q. NEW	23. Describe what these costs were for?	<b>new.</b> Have there been <u>other types of costs</u> related to <b>fish processing</b> activities during the last HIGH fishing season? YES . 1 NO ..2 >> Q. 24	<b>new.</b> (ONLY FOR HOUSEHOLDS WHO SMOKE FISH) Which kind of kiln do you use to smoke fish?	
AMOUNT	TEXT DESCRIPTION	AMOUNT	TEXT DESCRIPTION	
<b>new.</b> (ONLY FOR HOUSEHOLDS WHO SMOKE FISH) Which fuel or source of energy do you use to smoke fish?	<b>new.</b> (ONLY FOR HOUSEHOLDS WHO SMOKE FISH) How much fuel did you consume per day in the last high season?	<b>new.</b> (ONLY FOR HOUSEHOLDS WHO SMOKE FISH) In how many days?	<b>new.</b> (ONLY FOR HOUSEHOLDS WHO SMOKE FISH) How much did you usually spend per day for fuel to smoke fish?	24. What were the total costs during the HIGH season? <u>Unit:</u> week.....1 month...2
TEXT DESCRIPTION	_  _ · _  UNIT: _____	_  _	_  _ · _  CURRENCY: _____	_  _ · _  UNIT: _____

### 3.4. Comprehensive food security and vulnerability analysis surveys

Among the CFSVA surveys listed in Technical Report 2, the survey conducted in Ghana in 2008 has the highest number of questions related to woodfuel consumption and production.<sup>61</sup> Taking its Household Questionnaire as a benchmark, additional questions about consumption and production of woodfuel can be incorporated between section 7 – Food consumption and sources – and section 8 – Shocks, risks and coping, as described in table 3.11.

**Table 3.11. Questions of the WSM that can be incorporated into the household questionnaire of CFSVA surveys, based on the Ghana 2008 Household Questionnaire.**

<sup>61</sup> See table 2.9 in Technical Report 2. The household questionnaire of the 2008 Ghana Comprehensive Food Security and Vulnerability Analysis is available from: <http://catalog.ihsn.org/index.php/catalog/4096/download/55185>.

SECTION new – WOODFUEL CONSUMPTION AND PRODUCTION							
new.1		In the past month, did your household use firewood for:					
	Activity				new.1a Number of weeks	new.1b Number of days per week	new.1c Usual daily amount [1: kg; 2: bundles]
A	Cooking	1 Yes	2 No		_  _	_  _	_  _ .    Unit: _____
B	Heating space	1 Yes	2 No		_  _	_  _	_  _ .    Unit: _____
C	Lighting and other domestic purposes [boiling water, laundering, ironing, smoking against insects]	1 Yes	2 No		_  _	_  _	_  _ .    Unit: _____
D	Agricultural purposes [roasting coffee; curing tobacco; pasteurizing milk; preparing feed for animals; heating greenhouses, poultry-houses or swine-houses; drying tea, herbs, cassava]	1 Yes	2 No		_  _	_  _	_  _ .    Unit: _____
E	Commercial purposes [baking bread; smoking fish; brewing alcoholic beverages; vending street food; lodges and restaurants; artisanal workshops; micro-industries]	1 Yes	2 No		_  _	_  _	_  _ .    Unit: _____
F	Cultural and religious purposes [cremations; other religious rituals; cultural traditions].	1 Yes	2 No		_  _	_  _	_  _ .    Unit: _____

Table 3.11. (Cont'd)

new.2	ONLY FOR HOUSEHOLDS CONSUMING FUELWOOD (Otherwise go to question new.5) How was this wood acquired?
-------	--

	Source					new.2a Time needed to go, collect wood and go back home [in hours]	new.2b Usual place of collection (Choose codes)
A	Cutting trees	1	Yes	2	No	_   _. _	_   _. _
B	Collecting deadwood	1	Yes	2	No	_   _. _	_   _. _
C	Collecting recovered or used wood [from dumps, construction sites, old furniture...]	1	Yes	2	No	_   _. _	Codes for place of collection:  1 = Natural forest 2 = Forest plantation 3 = Bush, river banks 4 = Own farm, other agricultural land 5 = Roadside, urban or village area
D	Purchasing direct wood [from forests and plantations; thinning and logging by- products]	1	Yes	2	No	_   _. _	
E	Purchasing indirect wood [from wood mills; industrial by- products]	1	Yes	2	No	_   _. _	
F	Other [in-kind payments, barter, gifts, ...]	1	Yes	2	No	_   _. _	
<b>new.3</b>	ONLY FOR HOUSEHOLDS CUTTING OR COLLECTING FUELWOOD (Otherwise go to question new.4)						
	new.3a Number of weeks wood was cut or collected in the last month   _	new.3b Number of days per month fuelwood was cut or collected in the last:   _	new.3c Number of bundles of fuelwood usually cut or collected per day   _   _. _	new.3d Household members usually involved in cutting or collecting fuelwood (Use the members codes in section 1)   _   _. _   _   _. _			
<b>new.4</b>	ONLY FOR HOUSEHOLDS PURCHASING FUELWOOD (Otherwise go to question new.5)						
	new.4a Number of weeks fuelwood was purchased:   _	new.4b Number of days per week fuelwood was purchased:   _	new.4c Usual daily expenditure on fuelwood [in LC]:   _   _. _	new.4d Number of bundles of fuelwood purchased per day   _   _. _			
<b>new.5</b>	In the past month, did your household use charcoal for:						
	Activity					new.5a Number of weeks	new.5b Number of days per week
A	Cooking	1	Yes	2	No	_   _	_   _
B	Heating space	1	Yes	2	No	_   _	_   _
C	Lighting and other domestic purposes [boiling water, laundering, ironing, smoking against insects]	1	Yes	2	No	_   _	_   _

**Table 3.11 (Cont'd)**

D Agricultural purposes

	[Roasting coffee; curing tobacco; pasteurizing milk; preparing feed for animals; heating greenhouses, poultry-houses or swine-houses; drying tea, herbs, cassava]	1 Yes	2 No	_  _	_  _	_  _ . _  Unit: _____
E	<b>Commercial purposes</b> [Baking bread; smoking fish; brewing alcoholic beverages; vending street food; lodges and restaurants; artisanal workshops; micro-industries]	1 Yes	2 No	_  _	_  _	_  _ . _  Unit: _____
F	<b>Cultural and religious purposes</b> [Cremations; Other religious rituals; Cultural traditions].	1 Yes	2 No	_  _	_  _	_  _ . _  Unit: _____
<b>new.6</b>	ONLY FOR HOUSEHOLDS CONSUMING CHARCOAL (Otherwise go to question new.9) How was this charcoal <b>acquired</b> ?					
	Source				<b>new.6a</b> Days per month spent producing charcoal	<b>new.6c</b> Main origin of wood [Choose codes]
A	<b>Self-production</b> (Cutting trees)	1 Yes	2 No	_  _	_	
B	<b>Self-production</b> (Purchasing wood)	1 Yes	2 No	_  _	<b>Codes for place of collection:</b> 1 = Natural forest 2 = Forest plantation 3 = Bush, river banks 4 = Own farm, other agricultural land 5 = Roadside, urban or village area	
C	<b>Purchases</b>	1 Yes	2 No			
D	<b>Other</b> (In-kind payments, barter, gifts)	1 Yes	2 No			
<b>new.7</b>	ONLY FOR HOUSEHOLDS SELF-PRODUCING CHARCOAL (Otherwise go to question new.8)					
	<b>new.7a</b> Number of <b>sacks</b> of charcoal produced <b>per month</b>   _  _ . _	<b>new.7b</b> Type of <b>kiln</b> used to produce charcoal (See codes)   _	<b>new.7c</b> Household members usually involved in producing charcoal <b>Use member codes in section 1</b>   _  _ .   _ .     _  _ .   _ .	<b>Codes for type of kiln:</b> 1 = Earth pit 2 = Earth mound 3 = Casamance 4 = Other traditional kiln 5 = Ventilated brick kiln 6 = Ventilated steel kiln 7 = Portable steel kiln 8 = Other improved kiln		
<b>new.8</b>	ONLY FOR HOUSEHOLDS PURCHASING CHARCOAL (Otherwise go to question new.9)					
	Number of <b>sacks</b> purchased <b>per day</b>   _  _ . _	<b>new.8a</b> Usual daily expenditure on charcoal in [LC] during the last:   _  _ . _	<b>new.8b</b> Number of <b>months</b> charcoal was purchased during the last:   _  _	<b>new.8c</b> Number of <b>days</b> per month charcoal was purchased during the last:   _  _		

**Table 3.11 (Cont'd)**

new.9	ONLY FOR HOUSEHOLDS PRODUCING EITHER FUELWOOD OR CHARCOAL (Otherwise: skip to next section) Did woodfuel production have any of the following negative consequences on household members?				
	9.a Missed school days	9.b Schooling problems	9.c Injuries, ill-health	9.d Assaults, violence	9.e Other _____
01	_	_	_	_	_
02	_	_	_	_	_
03	_	_	_	_	_
04	_	_	_	_	_
05	_	_	_	_	_
06	_	_	_	_	_
07	_	_	_	_	_
08	_	_	_	_	_
09	_	_	_	_	_
10	_	_	_	_	_
11	_	_	_	_	_
12	_	_	_	_	_
13	_	_	_	_	_
14	_	_	_	_	_
15	_	_	_	_	_

Questions on scarcity of woodfuel can be added in section 8 – Shocks, risks and coping – as shown in table 3.12, while questions about the type of stove and the place of cooking can be added in section 3 – Housing, facilities and assets, as shown in table 3.13.

**Table 3.12. Additional questions - and answer categories - that can be added in section 8 of the household questionnaire of the CFSVA surveys, based on the Ghana 2008 Community Questionnaire.**

<b>SECTION 8 – SHOCKS, RISKS AND COPING</b>								
<b>8.0</b>	Has your household experienced any <b>difficulties</b> over the <b>last 12 months by order of importance?</b> <b>Do not read options. Circle up to 2 main difficulties identified by the respondent.</b>							
Climate, weather, nature related				Deaths, Illnesses related				
01	Late rain, drought, no water			41	Serious (chronic) illness or accident of HH member			
...	...			...	...			
06	Fire (brush)			44	Unusually high level of human disease			
Work, income related				House, land, assets related				
11	Loss of employment of household member			51	House damaged/destroyed			
12	Reduced income of household member			...	...			
Money, prices related				54	Crop failure			
21	Delayed pay/salary				Crime, conflict related			
...	...			61	Theft of money, HH utensils, business assets			
25	High fuel/transportation prices			62	Conflict/violence/rape/fighting within community			
Food related				Other				
31	Not enough money to buy food or cover other basic needs			71	Irregular/unsafe drinking water			
32	Unavailability of food			...				
				75	<b>Unavailability of wood or charcoal</b>			
				00	No shock or difficulty mentioned (or no second shock)			
<b>8.new</b>	ONLY FOR HOUSEHOLDS EXPERIENCING UNAVAILABILITY OF WOOD OR CHARCOAL (Otherwise go to question 8.3) In the past 12 months, during which months did your household have difficulties getting enough woodfuel? (circle all that apply)							
Jan	Feb	Mar	Apr	May	Jun	Jul		
Aug	Sep	Oct	Nov	Dec	Always	Never		
<b>8.new</b>	Did woodfuel scarcity create a decrease in your household's ability to:							
						<b>8.newa</b> Has the household recovered from the impact/consequences caused by this difficulty? 1 = Not recovered at all 2 = Partially recovered 3 = Completely recovered		
<b>A</b>	<b>Cooking food</b>			1	Yes	2	No	_
<b>B</b>	<b>Heating space</b>			1	Yes	2	No	_
<b>C</b>	<b>Perform other tasks</b>			1	Yes	2	No	_

Questions on woodfuel sales can be incorporated in section 5 – Income sources and access to credit (see table 3.14). These questions would follow question 5.0, which is about the three main activities that sustain the household. Selling of firewood and charcoal is listed among the possible answers.

**Table 3.13. Additional questions that can be added in Section 3 of the household questionnaire of CFSVA surveys, based on the Ghana 2008 household questionnaire.**

3.7	What are the <b>two main types of stove</b> used by your household for cooking?			
	<b>Type of stove and rank</b>		<b>Model (see codes)</b>	<b>Codes for energy source:</b> 1=Electricity 2=Straw/Shrubs/Grass 3=LPG 4=Agricultural crop residue 5=Animal dung 6=Kerosene 7=Gas 8=Biogas 9=Solar 10=wood 11=Charcoal 12=Other _____
	1 Three-stone fire	_	_	
	2 Mud stove	_	_	
	3 Ceramic stove	_	_	
	4 Pre-fabricated stove	_	_	
3.new	What are the <b>two main types of heating system</b> used by your household for heating space?			
	<b>Type of heater and rank</b>		<b>Model (see codes)</b>	<b>Codes for energy source:</b> 1=Electricity 2=Straw/Shrubs/Grass 3=LPG 4=Crop residue 5=Animal dung 6=Kerosene 7=Gas 8=Biogas 9=Solar 10=wood 11=Charcoal 12=Other _____
	1 Fireplace	_	_	
	2 Other traditional heater	_	_	
	3 Electric heater	_	_	
	4 Gas heater	_	_	
	5 Other improved heater	_	_	
	6 No second heater/no heating	_	_	

3.new	Where is the [name of appliance] located?						
	Type of appliance	Location (see codes)	Presence of chimney, extractor hood or windows in their proximity			Codes for location of stove/heater	
	1 Cooking stove	_	1 Yes	2	No	1=Outdoor 2=Indoor, in the living area 3=Indoor, in a separate room	
	2 Heater	_	1 Yes	2	No		
3.new	Did fuel combustion at home cause on household members any <b>health problem</b> ? (See codes)						
	a. Household member (See codes)	b. Type of health problem (see codes)	c. Type of fuel burning when problem arose (see codes)			Codes for health problems	
	1  _	_	_			1=Headaches, nausea 2=Skin/eye irritations 3=Sneezing nose, allergy, asthma 4=Burns, other injuries 5=Other _____	
	2  _	_	_				
	3  _	_	_				
	4  _	_	_				
3.8	What are the <b>two main sources</b> of lighting for this house? <b>Circle two and rank them</b>	Source and rank					
		1 Oil, kerosene or gas lantern  _	4 Candles  _	7	No lighting  _		
		2 Battery flashlights/fluorescent lights/tube light  _	5 Firewood  _	8	Solar  _		
		3 Electric generator/invertor  _	6 Electric company  _	9	Other  _		

**Table 3.14. Additional questions - and answer categories - that can be added in section 5 of the household questionnaire of CFSVA surveys, based on the Ghana 2008 Household questionnaire.**

5.new	ONLY FOR HOUSEHOLDS SELLING FIREWOOD OR CHARCOAL (Otherwise go to question 5.3) What was the <b>usual monthly income</b> derived from selling firewood or charcoal, in [LC], in the last:						
	Season and amount		5.new.a Number of months woodfuel was sold in the last:		5.new.b Main buyers of woodfuel (See codes)		Codes for sales of woodfuel:
	COLD SEASON:  _   _. _		_   _. _		_		1=Urban households 2=Rural households 3=Industrial plants, commercial activities 4=Charcoal producers 5=Transporters 6=Whole sellers 7=Retailers 8=Other _____
	HOT SEASON:  _   _. _		_   _. _		_		

With regard to the Community Questionnaire, questions on woodfuel can be added as described in table 3.15. In particular, the new section “Wood security” is built based on Section 4 “Food Security” and investigates the occurrence of difficulties in obtaining wood for fuel faced by the households of the community.

**Table 3.15. Additional questions - and answer categories - that can be added in the community questionnaire of CFSVA surveys, based on the Ghana 2008 Community Questionnaire.**

<b>2.2</b>	What are the <b>three main activities</b> in which the majority of people in this community are engaged in to obtain income and/or food? <b>Rank by order of importance (1 being the most important). Use codes below.</b>					
	Rank	<b>2.2a Activity</b>		<b>2.2b</b> What percentage of the people in the community is involved in each activity?		
	1			___%		
	2			___%		
	3			___%		
<b>Livelihood source codes</b>						
<b>Agriculture, Fishing, Livestock, Forestry</b>						
01	Food crop production	10	<b>Fuelwood production</b>			
...	...	11	<b>Charcoal production</b>			
<b>OMITTED</b>						
<b>2new</b>	What is the percentage of people relying on: a. Electricity b. Woodfuel c. Other sources of energy in this community?	<b>Source</b>		%		
		a. Electricity				
		b. Woodfuel				
		c. Other source				
<b>2.3</b>	<b>2.3a</b> Does any household in this community own any of the following items/services? <b>Please insert as appropriate</b> 1 = Yes 2 = No →	<b>2.3b</b> If yes, <b>how many households</b> within the community own the following items/services?		<b>OMITTED</b>		
<b>2.6</b>	Is there a market <b>for the following products</b> in this community?					
	1 Food	1 Yes	2 No	3 Don't know		
	2 Woodfuel	1 Yes	2 No	3 Don't know		
	3 ...	...				

**Table 3.15 (Cont'd)**

<b>SECTION new – WOOD SECURITY</b>														
<b>new.1</b>	Is there a period during the course of a <b>normal year</b> when it is difficult for households in this community to get enough wood?								<b>OMITTED</b>					
<b>new.2</b>	If yes, during which months is it generally difficult for households in this community to get enough wood? <b>Circle all that apply</b>													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
<b>new.3</b>	<b>Over the past 12 months</b> , was there a period in which it was difficult for households in this community to get enough wood?								<b>OMITTED</b>					
<b>new.4</b>	If yes, during which months was it difficult for households in this community to get enough wood? <b>Circle all that apply</b>													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
<b>new.5</b>	Would you say that more, less or the same number of households have access to enough wood compared to <b>12 months ago</b> ? <b>Circle one</b>								1	More				
									2	Less				
									3	Remained the same				
<b>new.6</b>	What are the reasons for the change?													
<b>6.4</b>	What are the <b>two most serious</b> schooling problems in your community? <b>Please circle the numbers in front of the identified reasons</b>													
1	Negative discrimination against girls					...	...							
...	...					10	Children involved in production of woodfuel							
5	High school fees					11	Other: Specify							
<b>8.5</b>	Has your community been affected by a <b>MAN-MADE DISASTER</b> in the last <b>12 months</b> and in which month?													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
...	...													
31	Air pollution													
32	Oil spillage													
33	Deforestation due to excessive production of fuelwood and charcoal													

Items in red are the new ones proposed.

### **3.5. Energy Sector Management Assistance Program: energy surveys and Multi-Tier Framework for Measuring Energy Access**

The World Bank Energy Sector Management Assistance Program (ESMAP) has conducted several national household surveys to collect data on the consumption of energy by households in rural areas. The energy survey questionnaire of the Peru country case study,<sup>62</sup> for instance, included the following sections: (a) characteristics of house; (b) characteristics of household members; (c) sources of energy; (d) productive equipment; (e) time use; (f) household income; (g) attitude; (h) business module; and (i) opinion and attitude towards business and energy.

The third section – Sources of energy – was subdivided into the following subsections: (a) use of electricity from interconnected grid and isolated systems; (b) use of kerosene; (c) Use of candles; (d) Use of dry cell batteries; (e) Use of car batteries; (f) use of LPG; (g) use of a solar home system; (h) electric generator set; (i) use of firewood; (j) use of agricultural residue; (k) animal dung; and (l) use of cooking stove and cooking.

Each subsection was activated by a positive answer to a filter question on the type of energy source used in the respondent's home. The questions related to woodfuel consumption and cooking stoves were the following:

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<sup>62</sup> See Meier *et al.*, 2010.

**Table 3.16. Questions on woodfuel and cooking in the Peru 2010 energy questionnaire of the ESMAP.**

SECTION 9 – USE OF FIREWOOD			
<b>372. In the past month did your household use firewood at home?</b>			
Yes	1		
No	2 Go to 376		
<b>373. How does your household obtain firewood?</b>			
Purchase only	1		
Collect/received only	2 Go to 375A		
Purchase and collect	3		
Other _____ (Specify)	4		
THE FOLLOWING ARE QUESTIONS FOR PURCHASED FIREWOOD			
<b>374A. How much did you spend during the last purchase?</b>		<b>374B. How many total days will this purchase last?</b>	<b>374C. What was the one-way distance traveled (in meters) to make this purchase?</b>
Code: Enter amount of money (in S.) spent last time. <i>*Don't include transportation cost</i>		Code: Enter number of days firewood lasted.	Code: Enter distance in km traveled, use fraction for less than one km. Does not know –8
Total S./	Decimal		
			Hour      Minute
			Adult Male
			Adult Female
			Child
THE FOLLOWING ARE QUESTIONS FOR COLLECTED FIREWOOD			
<b>375A. How many times did your household collect firewood last month?</b>		<b>375B. How many total days did the previous collected firewood last?</b>	<b>375C. What was the one-way distance traveled in the previous collection of firewood?</b>
Code: Number of collection		Code: Enter number of days firewood lasted.	Code: Enter distance in meters traveled, use fraction for less than one meter Does not know . . . –8
<b>375D. In the last week, how much time (hours per week) was used in collecting firewood by the following members?</b>			
Code: Enter number of hours or "0" for not spending any time Not applicable –7		Code: Enter hours of use with fraction., or “–7” for do not use	
Use Type		Hours	Minutes
Adult Male			
Adult Female			

Children		
----------	--	--

**Table 3.16 (Cont'd)'**

SECTION 12: USE OF COOKING STOVE AND COOKING					
We would like to ask about cooking fuels and the stoves and fires that the household uses during a usual week.					
<b>380A. What is the principle type of stove that your household uses to cook meals?</b> Enumerator: Ask respondent if it is possible to see the stove.	<b>380B. Where is this stove located?</b> Enumerator: Ask respondent if it is possible to see the stove and area where the stove is located.	<b>380C. Is there a window or vent in the cooking area?</b> Enumerator: Ask respondent if it is possible to see the stove and area where the stove is located.	<b>380D. What type of fuel does your household usually use with this stove?</b> Enter type of fuels that is used most often with this stove.	<b>380E. Does your household use any other kind of fuel with this stove?</b> Enter the second most often used fuel.	<b>380F. Who usually starts and tends this stove?</b> Check the household member ID in Section 200 HH Member ID (See code number in Section 200)
Code: 1 = Open fire e.g. three stones 2 = Traditional stove no chimney 3 = Traditional stove with chimney 4 = Gas/ kerosene stove -7 = Not applicable	Code: 1= Outdoors 2= Semi-enclosed 3= Separate kitchen 4= In living area	Code: 0= None 1= One only 2= Two or more	Code: 0=. None 1= Firewood 2= Crop residue or wood chips 3= Dung 4= Charcoal 5= Coal 6= Kerosene 7= LPG 8= Electricity	Code: 1= Firewood 2= Crop residue or wood chips 3= Dung cakes 4= Charcoal 5= Coal 6= Kerosene 7= LPG 8= Electricity	
Code Number	Code Number	Code Number	Code Number	Code Number	Code Number
1.					
2.					
3.					

Source: Annex 4 of Meier *et al.*, 2010.

The ESMAP energy questionnaire and its structure can be regarded as a benchmark for the development of a woodfuel questionnaire for stand-alone surveys. In particular, sections 8 and 9 are very useful for investigating the sources of energy for purposes other than domestic uses, such as agricultural or commercial activities.<sup>63</sup>

<sup>63</sup> "Business module" and "Opinion and attitude towards business and energy", respectively.

Section 6 – Household income – section 7 – attitude – section 8 – business module – and section 9 – opinion and attitude on energy and business – can also provide insights about the income generated by woodfuel sales, the types of productive activities that require the use of woodfuel and the household's attitude towards the use of such fuel. Section 4 – productive equipment – can be useful for seeking information about charcoal kilns and other equipment fed with woodfuel and used for agricultural or commercial activities, with a view to estimate the efficiency of fuel conversion.

More recently ESMAP has developed the Multi-Tier Framework (MTF) for measuring energy access that allows for computing a weighted index of access to energy for a given geographic area.<sup>64</sup> The data needed to build this index are collected through a new household energy questionnaire that collects also data on quantities of woodfuel used, purchased, and collected. The new questionnaire will allow for collecting detailed information on woodfuel consumption and production and on the technology used for cooking.

### **3.6. Other surveys: micro-enterprise and enterprise surveys, and the Agricultural Integrated Survey Programme.**

Inclusion of a WSM – albeit different from the one proposed in this report – can also be taken into consideration for micro-enterprise and enterprise surveys, with a view to estimate the share of energy derived from woodfuel by enterprises. About 500 enterprise surveys have been conducted in developing countries of the selected regions from 2000 to 2016 and are available on the International Household Survey Network website.<sup>65</sup> They include questions about the quantities of woodfuel consumed per month and expenditures on woodfuel for production activities.

Inclusion of selected questions on the production and consumption of woodfuel can also be considered for the Agricultural Integrated Survey (AGRIS) programme of the Global Strategy,<sup>66</sup> a ten-year integrated survey programme synchronized with the agricultural censuses. This programme is intended to decrease the burden of conducting censuses by scheduling the collection of thematic data over this time frame. It consists of a core module implemented

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<sup>64</sup> See the document [Capturing the Multi-Dimensionality of Energy Access](#).

See also: <https://www.esmap.org/node/55526> .

<sup>65</sup> These surveys are not listed in the Annexes of Technical Report 2 but are available from: <http://ihsn.org> .

<sup>66</sup> For a brief description of the project, see:

[http://www.fao.org/fileadmin/templates/rap/files/meetings/2015/151005\\_-\\_Session\\_6\\_-\\_AGRIS\\_Agricultural\\_Integrated\\_Survey\\_-\\_SPAFS.pdf](http://www.fao.org/fileadmin/templates/rap/files/meetings/2015/151005_-_Session_6_-_AGRIS_Agricultural_Integrated_Survey_-_SPAFS.pdf)

yearly, which focuses on themes that remain largely the same in each survey round, such as current agricultural production – and rotating modules administered every two to five years, depending on the module and countries' data demand and priorities. Rotating modules developed so far include questions on: (a) the economy, (b) the labour force, (c) machinery and equipment; and (d) production methods and environment. Questions on production and consumption of woodfuel by the agricultural holding can be considered for inclusion in the fourth rotating module.

## 4

## Woodfuel Indicators

A general overview of the implications of the chosen sampling strategy on data analysis, such as the need to weigh the results, - is included in the second part of annex 6. This section is mainly intended to describe the indicators that can be derived from the data gathered through the WSM. Such indicators can be used to monitor progress towards achieving some of the Sustainable Development Goals (SDGs) (see table 4.1) and other, country-specific, policy targets.

**Table 4.1 Contribution of the Woodfuel Supplementary Module towards the monitoring of the (SDGs).**

Sustainable Development Goals Indicators	Questions of the WSM
<b>3.9.1</b> Mortality rate attributed to <u>household</u> and ambient <u>air pollution</u>	<u>Section 3:</u> Household Fuel Combustion
<b>5.4.1</b> Proportion of time spent on <u>unpaid domestic</u> and care <u>work</u> , by sex, age and location;	Q. 6, 7, 8, 10, 11, 20, 21, 24 (short form); Q. 9, 10, 11, 14, 15, 27, 28, 34 (long Form)
<b>7.1.2</b> Proportion of population with primary reliance on clean fuels and technology;	<u>Section 3:</u> Household fuel combustion
<b>7.2.1</b> Renewable energy share in the total final energy consumption;	<u>Section 3:</u> Household fuel combustion
<b>8.4.1</b> Material footprint, material footprint <sup>67</sup> per capita;	Q. 1a, 1b, 1c, 9, 15a, 15b, 15c, 22, 23 (short form); Q. 1a, 1b, 1c, 2, 6, 12, 13, 21a, 21b, 21c, 25, 29, 30, 32, 33 (long form)
<b>8.8.1</b> Frequency rates of fatal and non-fatal occupational injuries, by sex and migrant status;	Q. 16, Q. 35 (long form)
<b>12.2.2</b> Domestic material consumption, domestic material consumption per capita.	Q. 1a, 1b, 1c, 15a, 15b, 15c (short form); Q. 1a, 1b, 1c, 21a, 21b, 21c (long form).

<sup>67</sup> See for instance Wiedmann *et al.* (2015).

With regard to the Minimum Set of Core Data of the Global Strategy, moreover, the information collected by means of the WSM will inform the following two indicators:

**Table 4.2 Contribution of the Woodfuel Supplementary Module towards the Minimum Set of Core Data of the Global Strategy.**

Minimum Set of Core Data - Indicators related to consumption and production of woodfuel	Section/Questions of the WSM
<b>Indicator 18:</b> Change in component of forestry balances (quantity and value of removals of products from forests, and respective utilization).	Q. 2, 12, 13, 31, 32, 33 (long form)
<b>Indicator 31:</b> Change in farm and rural non-farm household income from all sources.	Q. 14, 27 (short form) Q. 19, 38 (long form).

The following tables show the indicators that can be built based on the data collected through the short form of the WSM.

**Table 4.3. Share of households using fuelwood and charcoal on total households, by type of use and source.**

	National (%)	Urban (%)	Rural (%)
<b>Fuelwood</b>			
<i>Use</i>			
Cooking			
Heating space			
Other domestic uses			
Agricultural uses			
Commercial uses			
Cultural/Religious uses			
<i>Source</i>			
Purchase Only			
Collection Only			
Both			
<b>Charcoal</b>			
<i>Use</i>			
Cooking			
Heating space			
Other domestic uses			
Agricultural uses			
Commercial uses			
Cultural/religious uses			
<i>Source</i>			
Purchase only			
Collection only			
Both			

**Table 4.4. Quantity of woodfuel used by the household sector, by household size and type of use.**

	National (kg/hh <sup>1</sup> /day)	Urban (kg/hh/day)	Rural (kg/hh/day)	National (000t/y)	Urban (000t/y)	Rural (000t/y)
<b>Fuelwood</b>						
1-2 members						
3-4 members						
5+ members						
<i>Use</i>						
Cooking						
Heating space						
Other uses						
<b>Charcoal</b>						
1-2 members						
3-4 members						
5+ members						
<i>Use</i>						
Cooking						
Heating space						
Other uses						

1: hh = Household

**Table 4.5. Average household monthly expenditure on woodfuel (in local currency).**

	National (LC <sup>1</sup> /month)	Urban (LC/month)	Rural (LC/month)
Fuelwood			
1-2 members			
3-4 members			
5+ members			
Charcoal			
1-2 members			
3-4 members			
5+ members			

1: LC = Local Currency

**Table 4.6. Quantities of woodfuel produced by the household sector  
(in 000 ton per month).**

	National (000 t/month)	Urban (000 t/month)	Rural (000 t/month)
Fuelwood			
Charcoal			

**Table 4.7. Share of households involving children (5-17) and women in fuelwood and charcoal production on total number of households producing woodfuel.**

Fuelwood	National (%)	Urban (%)	Rural (%)
Children's involvement			
Women's involvement			
Charcoal			
Children's involvement			
Women's involvement			

**Table 4.8. Time spent collecting fuelwood.**

	National	Urban	Rural
Avg. number of days per month			
Total time (h/person/month)			
Adult males			
Adult females			
Children			

**Table 4.9 Charcoal production: total time spent and main type of kiln.**

	National	Urban	Rural
Total time (h/person/month)			
Adult males			
Adult females			
Children			
Main type of charcoal kiln			

**Table 4.10. Woodfuel sales: share of households selling woodfuel; quantity sold and average monthly income, country, year.**

	National	Urban	Rural
<b>Fuelwood</b>			
Share of households selling fuelwood			
Quantity sold (kg/hh <sup>1</sup> /month)			
Monthly income (LC <sup>2</sup> /hh)			
<b>Charcoal</b>			
Share of hh selling charcoal			
Quantity sold (kg/hh/month)			
Monthly income (LC/hh)			

1: hh = household; 2: LC = Local Currency.

**Table 4.11. Main cooking stove and heating system; main source of energy for cooking and heating space.**

	National (% hhs)	Urban (% hhs)	Rural (% hhs)
<b>Main cooking stove</b>			
Three stone fire			
Mud stove			
Ceramic stove			
Pre-fabricated stove			
No stove – no cooking			
<b>Main source of energy for cooking</b>			
Dung, crop residues			
Fuelwood			
Charcoal			
Gas			
Electricity			
Other			
<b>Main heater</b>			
Fireplace			
Other traditional heater			
Electric heater			
Gas heater			
Other improved heater			
No heating			
<b>Main source of energy for heating space</b>			
Dung, crop residues			
Fuelwood			
Charcoal			
Gas			
Electricity			
Other			

**Table 4.12. Household fuel combustion: location of stove and heater; presence of windows, hoods and chimneys.**

	National (% hhs)	Urban (% hhs)	Rural (% hhs)
<b>Location of cooking stove</b>			
Outdoor			
In a separate building			
Indoor, in the living area			
Indoor, in a dedicated room			
<b>Location of heating system</b>			
Outdoor			
In a separate building			
Indoor, in the living area			
Indoor, in a dedicated room			
<b>Presence of windows, hoods, chimneys</b>			
Cooking area			
Heating area			

The indicators shown in table 4.8 – about the time spent by household members in fuelwood collection – contribute to the estimation of the SDG indicator 5.4.1: proportion of time spent on unpaid domestic and care work, by sex, age and location, while those in tables 4.4 and 4.6 – about quantities of woodfuel used and produced by household members – contribute to the estimation of the SDG indicators 12.2.2: domestic material consumption per capita and 8.4.1: material footprint per capita.

The indicators in table 4.11 – type of cooking stove and heater – are closely related to the SDG Indicator 7.1.2: proportion of population with primary reliance on clean fuels and technology, while those in table 4.9 – main type of charcoal kiln – inform the SDG indicator 7.2.1: renewable energy share in the total final energy consumption. In fact, woodfuel is a renewable and climate friendly form of energy if produced sustainably and used efficiently. Its conversion and utilization efficiency, however, is far below the technical potential in many developing countries, particularly for the wood-to-charcoal conversion. Upgrading the conversion efficiency through the use of improved stoves and kilns could result in a large saving of wood for the same amount of charcoal (or energy) produced, and consequently reduce the demand for wood to be extracted from forests and trees outside forests.

Indicators in tables 4.11 and 4.12 help in building the SDG indicator 3.9.1: mortality rate attributed to household and ambient air pollution. Inefficient combustion of woodfuel with traditional stoves and heaters in houses with no windows or extractor hoods results in indoor air pollution and low efficiency for

thermal applications.<sup>68</sup> While advanced wood-burning stoves have reached the thermal efficiency of more than 70 percent, three-stone fires with a thermal efficiency of less than 20 percent are still widely used in many African countries (AFWC, 2016).

Finally, indicators in table 4.10 – about woodfuel sales - contribute to the building of indicator 31: change in farm and rural non-farm household income from all sources of the Global Strategy Minimum Set of Core Data.

The additional questions included in the long form of the WSM will allow for building the indicators described in Table 4.13.

**Table 4.13. Additional indicators that can be built from the data collected through the long form of the WSM.**

Indicators derived from the WSM – long form	Related SDG and Global Strategy indicators
1. Main wood species used for fuel and for producing charcoal (national; urban/rural);  2. Estimated amount of energy <sup>69</sup> obtained by households from woodfuel (national; urban/rural).	7.2.1 Renewable energy share in the total final energy consumption
3. Purchases of direct versus indirect wood (national; urban/rural).  4. Source of fuelwood and source of wood used to produce charcoal (national; urban/rural).	Indicator 18 of the Global Strategy Minimum Set of Core Data.
5. Prices of purchased fuelwood and charcoal (national; urban/rural)  6. Main buyer of woodfuel produced by households (national; urban/rural).	
7. Negative consequences of woodfuel production on household members, by fuel, type of problem, sex and age class (national; urban/rural).	8.8.1 Frequency rates of fatal and non-fatal occupational injuries, by sex and migrant status.
8. Negative effects of household fuel combustion on household members' health, by sex, age class and type of fuel (national; urban/rural).	3.9.1 Mortality rate attributed to household and ambient air pollution.
9. Occurrence of woodfuel shortages, month of occurrence and activities affected (national; urban/rural).	

<sup>68</sup> Some studies have proven the association of respiratory illnesses with the lack of a separate kitchen, or the absence of windows, extractor hoods and chimneys (See O'Sullivan and Barnes 2007, page 19).

<sup>69</sup> Gross energy consumption, measured in KiloJoule.

The wood species burnt at home – indicator number 1 in table 4.13 - can be a major determinant of health problems, as some wood species are toxic (see annex 7). Knowing the species of wood burnt and the type of kiln used, moreover, allows for the estimation of the efficiency of conversion of wood into charcoal, and of the wood biomass corresponding to a given quantity of produced charcoal.

The estimate of the amount of energy obtained by households from woodfuel – second indicator in the above table – will inform the SDG indicator 7.2.1: renewable energy share in the total final energy consumption. This estimation is made possible by the measurement of the humidity content of the main wood species used by households through electronic hygrometers. During the field test, the feasibility of such measurement and the reliability of the gathered data will be tested.

Indicators 3 and 4 – on the source of purchased and collected fuelwood – provide a more precise estimate of the impact of woodfuel consumption on forests. Indicators 5 and 6 will provide useful information about the fuelwood and charcoal value chains, and the different types of supply chains, while indicators 7 and 8 will provide information on the negative consequences on human health associated with woodfuel production and consumption.

Indicator 9 provides useful information for policy makers by highlighting the periods of the year when woodfuel shortages affect the livelihoods and well-being of households. In fact, the availability of woodfuel is fundamental for households' food security in many developing countries.

Additional analyses can be performed to identify the patterns of woodfuel consumption and production, such as quantities consumed and main type of stove, across income deciles or by class of household size by matching the information collected through the proposed WSM with the other socio-economic characteristics of the households.

Woodfuel indicators can also be compared with indicators obtained from data from other sections of the questionnaire. For example, expenditure on woodfuel can be compared to other household expenditure in order to estimate the incidence of woodfuel in total household expenditure, or in the costs associated to an agricultural or commercial activity.

Value chain analyses can be performed by comparing, for instance, the average producer price and consumer price of fuelwood and charcoal, or the average prices in urban and rural areas.

Other indicators can be built starting from the information collected at the community level, such as the type of tenure of forest areas where wood is cut or collected and charcoal is produced, legal aspects of charcoal production, and the occurrence of deforestation because of woodfuel production.

# 5

## Limitations and Steps Forward

The proposed WSM contributes to the setting of numerous woodfuel indicators and can be used to inform several SDG indicators. A number of socio-economic, health and environmental aspects related to the consumption and production of woodfuel, however, cannot be fully captured by the WSM, because the size of the module would need to be increased to cover the additional questions required. Some of the aspects that are not captured by the WSM are the following:

- Total energy requirement of a household. The gathered information on the household size and the type of stoves and kilns used provide useful insights in the direction of estimating household energy requirements. Differences in thermal efficiency of a dwelling and in climatic conditions, however, should be taken into account to estimate energy requirements for heating space, but they fall outside the scope of the WSM.
- Type of tenure<sup>70</sup> of forest areas where wood is cut or collected and charcoal is produced, and legal aspects related to charcoal production.<sup>71</sup>
- Distance in km from the source of wood. Accordingly, spatial analyses cannot be performed and the WISDOM model cannot be applied. Additional questions would be required to identify the exact location of the source of wood.<sup>72</sup> However, the information on the quantity consumed by households – when matched with the household's location – already provides useful insights about the spatial patterns of the demand side.
- The concentration of indoor air pollutants and its correlation with the various types of cooking fuels and stoves used by the households.<sup>73</sup>

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<sup>70</sup> According to Jagger & Luckert (2014) the type of tenure is a key determinant of the income that can be derived from forest resources.

<sup>71</sup> Although questions on these topics could be added in the Community questionnaires of the Living Standard Measurement Study and Comprehensive Food Security and Vulnerability Analysis surveys, as shown in section 3.

<sup>72</sup> For a quick overview of the WISDOM methodology, see:  
<ftp://ftp.fao.org/docrep/fao/008/j5135e/j5135e02.pdf>

<sup>73</sup> Although this may be possible in case of computer-assisted personal interviewing data collection by means of electronic devices connected to the tablet.

- Households' self-evaluation of the available sources of energy.

These and other topics can be considered for inclusion in a future stand-alone woodfuel survey, which could target not only households but also small-scale holdings, public facilities and woodfuel traders.

The following steps of the project will be (a) the writing of a field test protocol, to be included in the forthcoming Technical Report 4; (b) the implementation of a field test of the module in two selected countries, and (c) the writing of the final guidelines on how to incorporate the WSM into existing surveys, which will include the outcomes of the expert group meeting and the two field tests.<sup>74</sup>

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<sup>74</sup> See annex 1 for an overall description of the project and its phases.

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## Annex 1.

## Project overview

Woodfuel is the main source of energy for millions of people to meet their basic needs and an important source of income and employment for rural households, although its use is often associated with socio-economic, environmental and health drawbacks. The provision of affordable and sustainable woodfuel and its improved use in developing countries would contribute to the overall mission to reduce poverty and improve people's health and well-being. An important step towards this ultimate goal is to understand the magnitude and scale of its supply and demand: how much woodfuel is consumed globally each year, by whom, and for which purposes? Who is involved in producing woodfuel, and to what extent? Where does woodfuel mainly come from?

Unfortunately, many developing countries lack reliable data to estimate the patterns and trends of woodfuel consumption and production in their countries. As woodfuel is predominately produced and traded in the informal sector, quantities consumed and the labour associated with the production of fuelwood and charcoal are not taken into account by the national statistical systems of many countries. As a result, the impact of woodfuel production on local economies and livelihoods are largely underestimated.

The costs to conduct a stand-alone national survey on woodfuel could be prohibitively high. The purpose of this project is to provide a methodology to integrate a WSM into existing household surveys in order to enable developing countries to enhance national socio-economic statistics on the production and consumption of woodfuel. The WSM introduces internationally harmonized questions that helps countries to collect more relevant and systematic information on woodfuel, avoiding double counting and making data internationally comparable. The scope of the project is limited to small-scale, informal production and consumption of woodfuel at the household level. The improvement in national statistical capacity will ultimately benefit policy makers, economic entities and forest-dependent people through improved data availability and quality for evidence-based policies, programme development and interventions.

Main activities and associated outputs of the project

**Activity 1:** Review existing literature on national woodfuel statistics in developing countries, survey-based woodfuel studies and international recommendations on woodfuel survey (*Technical Report 1*).

**Activity 2:** Review current national sources that could potentially incorporate the woodfuel module as a supplementary component as well as the questions of national censuses and surveys (*Technical Report 2*).

**Activity 3:** Prepare the proposal of the methodology to include a woodfuel survey module with suggestions on data analysis and other relevant statistical issues (*Technical Report 3*).

**Activity 4:** Prepare a field-test protocol (*Technical Report 4*) and discuss it at an expert group meeting along with the other technical reports.

**Activity 5:** Finalize the methodological proposal, which includes inputs from the expert group meeting, and organize field-tests in two countries to test the methodology.

**Activity 6:** Undertake field tests in two pilot countries and draw up a technical report that contains the findings from the field tests.

**Activity 7:** Prepare the final guidelines.

# Annex 2.

## Woodfuel Supplementary Module, short form, PAPI

### S1A. FUELWOOD USE

**1. IN THE LAST MONTH, DID ANYONE IN YOUR HOUSEHOLD USE FUELWOOD FOR COOKING, HEATING SPACE OR FOR ANY OTHER DOMESTIC, AGRICULTURAL, COMMERCIAL, RELIGIOUS OR CULTURAL PURPOSE?**

**1a. How many days per week?    1b. In how many weeks?    1c. What was the usual daily amount<sup>1</sup>?**

COOKING .....	<input type="checkbox"/> Yes <input type="checkbox"/> No	□	□	□	kg <input type="checkbox"/> bundles
HEATING SPACE .....	<input type="checkbox"/> Yes <input type="checkbox"/> No	□	□	□	kg <input type="checkbox"/> bundles
OTHER DOMESTIC USES .....	<input type="checkbox"/> Yes <input type="checkbox"/> No	□	□	□	kg <input type="checkbox"/> bundles
AGRICULTURAL USES .....	<input type="checkbox"/> Yes <input type="checkbox"/> No	□	□	□	kg <input type="checkbox"/> bundles
COMMERCIAL USES.....	<input type="checkbox"/> Yes <input type="checkbox"/> No	□	□	□	kg <input type="checkbox"/> bundles
CULTURAL/RELIGIOUS USES ...	<input type="checkbox"/> Yes <input type="checkbox"/> No	□	□	□	kg <input type="checkbox"/> bundles

**HOW TO WEIGH WOOD:** The first time wood is weighed, please form a **bundle** and weigh it with the provided **scale**. For the following quantities, express them in number of bundles like the one just weighed.

**OTHER DOMESTIC USES:** Lighting, boiling water, laundering, ironing, smoking against insect.

**AGRICULTURAL USES:** Roasting coffee; curing tobacco; pasteurizing milk; preparing feed for animals; heating greenhouses, poultry-houses or swine-houses; drying tea, herbs, tapioca.

**COMMERCIAL USES:** baking bread; smoking fish; brewing alcoholic beverages; street food vending; lodges and restaurants; artisanal workshops; micro-industries.

**CULTURAL AND RELIGIOUS USES:** cremations; other religious rituals; other cultural traditions.

### S1B. FUELWOOD ACQUISITION

**2. IN THE LAST MONTH, DID YOU OR ANY MEMBER OF THE HOUSEHOLD PURCHASE FUELWOOD, EXCLUDING WOOD TO PRODUCE CHARCOAL?**    Yes  → Q. 3    No  → Q. 6

3. IN HOW MANY WEEKS?	4. HOW MANY DAYS PER WEEK?	5. WHAT WAS THE AVERAGE DAILY EXPENDITURE ON FUELWOOD, IN [LOCAL CURRENCY]? <u>Currency</u>
□	□	□.□.□ □

**6. IN THE LAST MONTH, DID YOU OR ANY MEMBER OF YOUR HOUSEHOLD CUT OR COLLECT FUELWOOD?**    Yes  → Q. 7    No  → Q. 12

7. IN HOW MANY WEEKS?	8. HOW MANY DAYS PER WEEK?	9. HOW MANY BUNDLES WERE USUALLY CUT OR COLLECTED PER DAY? (in case wood was not weighed before, form a bundle, weigh it with the scale and ask the number of bundles sold; report final quantity in kg). <u>□.□.□ □ kg</u> <input type="checkbox"/> bundles
□	□	□.□.□ □

**10. HOW LONG DOES IT TAKE TO GO FROM YOUR HOUSE TO THE EDGE OF THE MAIN COLLECTING AREA AND BACK, AND TO COLLECT FUELWOOD, IN HOURS?** ..... TRAVEL TIME: ..... □.□.□ hrs  
COLLECTING TIME ... □.□.□ hrs

**11. WHICH HOUSEHOLD MEMBERS WERE USUALLY INVOLVED IN FUELWOOD COLLECTION?**  
(Use codes in the household roster)

1. _____	5. _____	9. _____	13. _____
2. _____	6. _____	10. _____	14. _____
3. _____	7. _____	11. _____	15. _____
4. _____	8. _____	12. _____	16. _____

### S1C. FUELWOOD SALES

12. IN THE <b>LAST MONTH</b> , DID YOU OR ANY MEMBER OF THE HOUSEHOLD <b>SELL</b> FUELWOOD? Yes <input type="checkbox"/> → Q. 13 No <input type="checkbox"/> → Q. 15	
<b>13. HOW MANY BUNDLES WERE SOLD?</b> (in case wood was not weighed before, form a bundle, weigh it with the scale and ask the number of bundles sold; report final quantity in kg).	<b>14. WHAT WAS THE <b>MONTHLY</b> INCOME DERIVED BY YOUR HOUSEHOLD FROM FUELWOOD SALES? (in <b>local currency</b>)</b>
<u>  </u> . <u>  </u> . <u>  </u> <input type="checkbox"/> kg <input type="checkbox"/> bundles	<u>  </u> . <u>  </u> . <u>  </u> <u>Currency</u>

### S2A. CHARCOAL USE

15. IN THE <b>LAST MONTH</b> , DID ANYONE IN YOUR HOUSEHOLD <b>USE</b> CHARCOAL FOR <u>COOKING</u> , <u>HEATING SPACE</u> OR FOR ANY OTHER <u>DOMESTIC</u> , <u>AGRICULTURAL</u> , <u>COMMERCIAL</u> , <u>RELIGIOUS</u> OR <u>CULTURAL</u> PURPOSE?					
15a. How many <b>days</b>		15b. In how <b>per week?</b>	15c. What was the <b>usual</b> many <b>weeks?</b> <b>daily</b> amount!?		
COOKING .....	<input type="checkbox"/> Yes <input type="checkbox"/> No	<u>  </u>	<u>  </u>	<u>  </u> . <u>  </u> . <u>  </u> <input type="checkbox"/> kg <input type="checkbox"/> sacks	
HEATING SPACE .....	<input type="checkbox"/> Yes <input type="checkbox"/> No	<u>  </u>	<u>  </u>	<u>  </u> . <u>  </u> . <u>  </u> <input type="checkbox"/> kg <input type="checkbox"/> sacks	
OTHER DOMESTIC USES .....	<input type="checkbox"/> Yes <input type="checkbox"/> No	<u>  </u>	<u>  </u>	<u>  </u> . <u>  </u> . <u>  </u> <input type="checkbox"/> kg <input type="checkbox"/> sacks	
AGRICULTURAL USES .....	<input type="checkbox"/> Yes <input type="checkbox"/> No	<u>  </u>	<u>  </u>	<u>  </u> . <u>  </u> . <u>  </u> <input type="checkbox"/> kg <input type="checkbox"/> sacks	
COMMERCIAL USES.....	<input type="checkbox"/> Yes <input type="checkbox"/> No	<u>  </u>	<u>  </u>	<u>  </u> . <u>  </u> . <u>  </u> <input type="checkbox"/> kg <input type="checkbox"/> sacks	
CULTURAL/RELIGIOUS USES ...	<input type="checkbox"/> Yes <input type="checkbox"/> No	<u>  </u>	<u>  </u>	<u>  </u> . <u>  </u> . <u>  </u> <input type="checkbox"/> kg <input type="checkbox"/> sacks	
<b>HOW TO WEIGH CHARCOAL:</b> The first time charcoal is weighed, please fill a <b>sack</b> and weigh it with the provided <b>scale</b> . For the following quantities, express them in number of sacks like the one just weighed.					
<b>OTHER DOMESTIC USES:</b> Lighting, boiling water, laundering, ironing, smoking against insect. <b>AGRICULTURAL USES:</b> Roasting coffee; curing tobacco; pasteurizing milk; preparing feed for animals; heating greenhouses, poultry-houses or swine-houses; drying tea, herbs, tapioca. <b>COMMERCIAL USES:</b> baking bread; smoking fish; brewing alcoholic beverages; street food vending; lodges and restaurants; artisanal workshops; micro-industries. <b>CULTURAL AND RELIGIOUS USES:</b> cremations; other religious rituals; other cultural traditions.					

### S2B. CHARCOAL ACQUISITION

16. IN THE <b>LAST MONTH</b> , DID YOU OR ANY MEMBER OF THE HOUSEHOLD <b>PURCHASE</b> CHARCOAL?					
Yes <input type="checkbox"/> → Q. 17			No <input type="checkbox"/> → Q. 20		
<b>17. IN HOW MANY WEEKS?</b> <u>  </u>	<b>18. HOW MANY DAYS PER WEEK?</b> <u>  </u>	<b>19. WHAT WAS THE AVERAGE DAILY EXPENDITURE ON CHARCOAL, IN [LOCAL CURRENCY]? <u>Currency</u></b> <u>  </u> . <u>  </u> . <u>  </u>			
20. IN THE <b>LAST MONTH</b> , DID YOU OR ANY MEMBER OF YOUR HOUSEHOLD <b>PRODUCE</b> CHARCOAL?					
Yes <input type="checkbox"/> → Q. 21			No <input type="checkbox"/> → Q. 25		
<b>21. HOW MANY DAYS DID YOUR HOUSEHOLD SPEND PRODUCING CHARCOAL?</b> (this includes: going from home to the main charcoal production area and back; acquiring and transporting wood; preparing the kiln; burning wood and discharging charcoal). <u>  </u> . <u>  </u> days			<b>22. HOW MANY SACKS OF CHARCOAL WERE PRODUCED IN TOTAL?</b> (in case charcoal was not weighed before, fill a sack, weigh it with the scale and ask the number of sacks sold; report final quantity in kg). <u>  </u> . <u>  </u> . <u>  </u> <input type="checkbox"/> kg <input type="checkbox"/> sacks		

**23. WHAT TYPE OF KILN WAS USED TO PRODUCE CHARCOAL?**

EARTH PIT .....	<input type="checkbox"/>	VENTILATED BRICK KILN .....	<input type="checkbox"/>
EARTH MOUND .....	<input type="checkbox"/>	VENTILATED STEEL KILN .....	<input type="checkbox"/>
CASAMANCE .....	<input type="checkbox"/>	PORTABLE STEEL KILN .....	<input type="checkbox"/>
OTHER TRADITIONAL KILN (_____)	<input type="checkbox"/>	OTHER IMPROVED KILN (_____)	<input type="checkbox"/>

**24. WHICH HOUSEHOLD MEMBERS WERE USUALLY INVOLVED IN CHARCOAL PRODUCTION?**

(Use codes in the household roster)

1. _____	5. _____	9. _____	13. _____
2. _____	6. _____	10. _____	14. _____
3. _____	7. _____	11. _____	15. _____
4. _____	8. _____	12. _____	16. _____

## S2C. CHARCOAL SALES

**25. IN THE LAST MONTH, DID YOU OR ANY MEMBER OF THE HOUSEHOLD SELL CHARCOAL?** Yes  → Q. 26  
No  → Q. 28

**26. HOW MANY SACKS WERE SOLD?** (in case charcoal was not weighed before, fill a sack, weigh it with the scale and ask the number of sacks sold; report final quantity in kg).

\_\_\_\_\_  kg  sacks

**27. WHAT WAS THE MONTHLY INCOME DERIVED BY YOUR HOUSEHOLD FROM CHARCOAL SALES, IN [LOCAL CURRENCY]?**

Currency

\_\_\_\_\_

## S3. HOUSEHOLD FUEL COMBUSTION

**28. WHAT IS THE MAIN STOVE USED BY YOUR HOUSEHOLD FOR COOKING?**

28A. ENERGY SOURCE (Use codes)	28B. MODEL (Name)	28C. LOCATION (Use codes)	28D. PRESENCE OF CHIMNEY, HOOD, WINDOW
THREE-STONE FIRE .....	<input type="checkbox"/> ..... <input type="checkbox"/> ..... <input type="checkbox"/> .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>
MUD STOVE .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>
CERAMIC STOVE .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>
PRE-FABRICATED STOVE .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>
NO STOVE / NO COOKING ...	<input type="checkbox"/> ..... <input type="checkbox"/> .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>

**29. WHAT DOES YOUR HOUSEHOLD MAINLY USE FOR HEATING SPACE?**

29A. ENERGY SOURCE (Use codes)	29B. MODEL (Name)	29C. LOCATION (Use codes)	29D. PRESENCE OF CHIMNEY, HOOD, WINDOW
FIREPLACE .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>
OTHER TRADITIONAL HEATER...	<input type="checkbox"/> ..... <input type="checkbox"/> .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>
ELECTRIC HEATER .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>
GAS HEATER .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>
OTHER IMPROVED HEATER .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>
NO HEATING .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	<input type="checkbox"/> ..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>

**CODES FOR ENERGY SOURCE:** 1 = DUNG, CROP RESIDUES; 2 = FUELWOOD; 3 = CHARCOAL; 4 = GAS;  
5 = ELECTRICITY; 6 = OTHER.      **MODEL:** see attached **stove card**.

**CODES FOR LOCATION:** 1 = OUTDOOR; 2 = IN A SEPARATE BUILDING; 3 = INDOOR, IN THE LIVING AREA;  
4 = INDOOR, IN A DEDICATED ROOM

# Annex 3.

## Woodfuel Supplementary Module, long form, PAPI

### S1A. FUELWOOD USE

<b>1. IN THE LAST MONTH, DID ANYONE IN YOUR HOUSEHOLD USE FUELWOOD FOR <u>COOKING</u>, HEATING SPACE OR FOR ANY OTHER <u>DOMESTIC</u>, <u>AGRICULTURAL</u>, <u>COMMERCIAL</u>, <u>RELIGIOUS</u> OR <u>CULTURAL</u> PURPOSE?</b>									
1a. How many <b>days per week?</b>					1b. In how many weeks?		1c. What was the <b>usual daily amount<sup>1</sup>?</b>		
COOKING .....	<input type="checkbox"/> Yes	<input type="checkbox"/> No	□	□	□	□	□	□	kg <input type="checkbox"/> bundles
HEATING SPACE .....	<input type="checkbox"/> Yes	<input type="checkbox"/> No	□	□	□	□	□	□	kg <input type="checkbox"/> bundles
OTHER DOMESTIC USES .....	<input type="checkbox"/> Yes	<input type="checkbox"/> No	□	□	□	□	□	□	kg <input type="checkbox"/> bundles
AGRICULTURAL USES .....	<input type="checkbox"/> Yes	<input type="checkbox"/> No	□	□	□	□	□	□	kg <input type="checkbox"/> bundles
COMMERCIAL USES.....	<input type="checkbox"/> Yes	<input type="checkbox"/> No	□	□	□	□	□	□	kg <input type="checkbox"/> bundles
CULTURAL/RELIGIOUS USES ...	<input type="checkbox"/> Yes	<input type="checkbox"/> No	□	□	□	□	□	□	kg <input type="checkbox"/> bundles
<b>HOW TO WEIGH WOOD:</b> The first time wood is weighed, please form a <b>bundle</b> and weigh it with the provided <b>scale</b> . For the following quantities, express them in number of bundles like the one just weighed.									
<b>OTHER DOMESTIC USES:</b> Lighting, boiling water, laundering, ironing, smoking against insect. <b>AGRICULTURAL USES:</b> Roasting coffee; curing tobacco; pasteurizing milk; preparing feed for animals; heating greenhouses, poultry-houses or swine-houses; drying tea, herbs, tapioca. <b>COMMERCIAL USES:</b> baking bread; smoking fish; brewing alcoholic beverages; street food vending; lodges and restaurants; artisanal workshops; micro-industries. <b>CULTURAL AND RELIGIOUS USES:</b> cremations; other religious rituals; other cultural traditions.									
2. WHAT IS THE <u>MAIN WOOD SPECIES</u> USED FOR FUEL? (Use local name of plants) ... _____									
2.a [ENUMERATOR: take the hygrometer provided to you and measure the water content of wood] ... _____									

### S1B. FUELWOOD ACQUISITION

3. IN THE LAST MONTH, DID YOU OR ANY MEMBER OF THE HOUSEHOLD <b>PURCHASE</b> FUELWOOD, EXCLUDING WOOD TO PRODUCE CHARCOAL? Yes <input type="checkbox"/> → Q. 4 No <input type="checkbox"/> → Q. 9									
4. IN HOW MANY WEEKS? □ weeks	5. HOW MANY DAYS PER WEEK? □ days	6. HOW MANY BUNDLES WERE USUALLY PURCHASED PER DAY? (in case wood was not weighed before, form a bundle, weigh it with the scale and ask the number of bundles sold; report final quantity in kg). □ □ □ . □ □ kg <input type="checkbox"/> bundles							
7. WHAT WAS THE USUAL DAILY EXPENDITURE ON FUELWOOD, IN [LOCAL CURRENCY]? □ □ □ . □ _____				8. WHAT <b>KIND OF WOOD</b> DID YOU <u>MAINLY</u> PURCHASE? <u>DIRECT</u> WOOD [From forests and plantations; thinning and logging by-products] ..... <input type="checkbox"/> <u>INDIRECT</u> WOOD [From wood mills; industrial by-products] ..... <input type="checkbox"/>					
9. IN THE LAST MONTH, DID YOU OR ANY MEMBER OF THE HOUSEHOLD <b>CUT OR COLLECT</b> FUELWOOD? Yes <input type="checkbox"/> → Q. 10 No <input type="checkbox"/> → Q. 17									
10. IN HOW MANY WEEKS? □	11. HOW MANY DAYS PER WEEK? □	12. HOW MANY BUNDLES WERE USUALLY CUT OR COLLECTED PER DAY? (in case wood was not weighed before, form a bundle, weigh it with the scale and ask the number of bundles sold; report final quantity in kg). □ □ □ . □ □ kg <input type="checkbox"/> bundles							

<b>13. WHERE WAS WOOD MAINLY COLLECTED?</b>	<b>14. HOW LONG DID IT TAKE TO GO FROM YOUR HOUSE TO THE EDGE OF THE MAIN COLLECTING AREA AND BACK, AND TO COLLECT FUELWOOD, IN HOURS?</b>			
NATURAL FOREST ..... <input type="checkbox"/>	TRAVEL TIME: ..... <u>  </u> . <u>  </u> . <u>  </u> hrs			
FOREST PLANTATION ..... <input type="checkbox"/>	COLLECTING TIME ... <u>  </u> . <u>  </u> . <u>  </u> hrs			
BUSH, RIVER BANKS ..... <input type="checkbox"/>				
OWN FARM ..... <input type="checkbox"/>				
OTHER AGRICULTURAL LAND ..... <input type="checkbox"/>				
URBAN/VILLAGE AREA, ROADSIDE ..... <input type="checkbox"/>				
CONSTRUCTION SITES, DUMPS ..... <input type="checkbox"/>				
OTHER ( _____ ) ..... <input type="checkbox"/>				
<b>15. WHICH HOUSEHOLD MEMBERS WERE USUALLY INVOLVED IN FUELWOOD COLLECTION? (Use codes in the household roster)</b>				
<b>16. DID FUELWOOD COLLECTION HAVE ANY OF THE FOLLOWING NEGATIVE CONSEQUENCES ON [NAME]?</b>				
MISSED SCHOOL DAYS	SCHOOLING PROBLEMS	INJURIES, ILL-HEALTH	ASSAULTS, VIOLENCE	OTHER
1. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### S1C. FUELWOOD SALES

<b>17. IN THE LAST MONTH, DID YOU OR ANY MEMBER OF THE HOUSEHOLD SELL FUELWOOD? Yes <input type="checkbox"/> →Q. 18 No <input type="checkbox"/> →Q. 21</b>		
<b>18. HOW MANY BUNDLES WERE SOLD?</b> (in case wood was not weighed before, form a bundle, weigh it with the scale and ask the number of bundles sold; report final quantity in kg).  <u>  </u> . <u>  </u> . <u>  </u> <input type="checkbox"/> kg <input type="checkbox"/> bundles	<b>19. WHAT WAS THE MONTHLY INCOME DERIVED BY YOUR HOUSEHOLD FROM FUELWOOD SALES? (in local currency)</b>  <u>  </u> . <u>  </u> . <u>  </u> <u>  </u> _____	<b>20. TO WHOM DID YOUR HOUSEHOLD MOSTLY SELL FUELWOOD?</b>  URBAN HOUSEHOLDS ..... <input type="checkbox"/> RURAL HOUSEHOLDS ..... <input type="checkbox"/> INDUSTRIAL PLANTS ..... <input type="checkbox"/> COMMERCIAL ACTIVITIES ..... <input type="checkbox"/> CHARCOAL PRODUCERS ..... <input type="checkbox"/> TRANSPORTERS, WHOLE SELLERS ..... <input type="checkbox"/> RETAILERS ..... <input type="checkbox"/> OTHER ( _____ ) ..... <input type="checkbox"/>

## S2A. CHARCOAL USE

**21. IN THE LAST MONTH, DID ANYONE IN YOUR HOUSEHOLD USE CHARCOAL FOR COOKING, HEATING SPACE OR FOR ANY OTHER DOMESTIC, AGRICULTURAL, COMMERCIAL, RELIGIOUS OR CULTURAL PURPOSE?**

**21A. In how many weeks?**      **21B. How many days per week?**      **21C. What was the usual daily amount?**

COOKING .....	<input type="checkbox"/> Yes <input type="checkbox"/> No	_	_	_ .	<input type="checkbox"/> kg <input type="checkbox"/> sacks
HEATING SPACE .....	<input type="checkbox"/> Yes <input type="checkbox"/> No	_	_	_ .	<input type="checkbox"/> kg <input type="checkbox"/> sacks
OTHER DOMESTIC USES .....	<input type="checkbox"/> Yes <input type="checkbox"/> No	_	_	_ .	<input type="checkbox"/> kg <input type="checkbox"/> sacks
AGRICULTURAL USES .....	<input type="checkbox"/> Yes <input type="checkbox"/> No	_	_	_ .	<input type="checkbox"/> kg <input type="checkbox"/> sacks
COMMERCIAL USES.....	<input type="checkbox"/> Yes <input type="checkbox"/> No	_	_	_ .	<input type="checkbox"/> kg <input type="checkbox"/> sacks
CULTURAL/RELIGIOUS USES ...	<input type="checkbox"/> Yes <input type="checkbox"/> No	_	_	_ .	<input type="checkbox"/> kg <input type="checkbox"/> sacks

**HOW TO WEIGH CHARCOAL:** The first time charcoal is weighed, please fill a **sack** and weigh it with the provided **scale**. For the following quantities, express them in number of sacks like the one just weighed.

**OTHER DOMESTIC USES:** Lighting, boiling water, laundering, ironing, smoking against insect.

**AGRICULTURAL USES:** Roasting coffee; curing tobacco; pasteurizing milk; preparing feed for animals; heating greenhouses, poultry-houses or swine-houses; drying tea, herbs, tapioca.

**COMMERCIAL USES:** baking bread; smoking fish; brewing alcoholic beverages; street food vending; lodges and restaurants; artisanal workshops; micro-industries.

**CULTURAL AND RELIGIOUS USES:** cremations; other religious rituals; other cultural traditions.

## S2B. CHARCOAL ACQUISITION

**22. IN THE LAST MONTH DID YOUR HOUSEHOLD PURCHASE CHARCOAL?**

Yes  → Q. 23 No  → Q. 27

<b>23. IN HOW MANY WEEKS?</b> _  days	<b>24. HOW MANY DAYS PER WEEK?</b> _  weeks	<b>25. HOW MANY SACKS WERE USUALLY PURCHASED PER DAY?</b> (in case charcoal was not weighed before, fill a sack, weigh it with the scale and ask the number of sacks sold; report final quantity in kg). _ .  .   kg <input type="checkbox"/> sacks
--	--	--

**26. WHAT WAS THE USUAL DAILY EXPENDITURE ON CHARCOAL, IN [LOCAL CURRENCY]? |\_|. |. | \_\_\_\_\_**

**27. IN THE LAST MONTH, DID YOU OR ANY MEMBER OF YOUR HOUSEHOLD PRODUCE CHARCOAL?**

Yes  → Q. 28      No  → Q. 36

<b>28. HOW MANY DAYS DID YOUR HOUSEHOLD SPEND PRODUCING CHARCOAL?</b> (this includes: going from home to the main charcoal production area and back; acquiring and transporting wood; preparing the kiln; burning wood and discharging charcoal).  _ .   days	<b>29. HOW MANY SACKS WERE PRODUCED IN TOTAL?</b> (in case charcoal was not weighed before, fill a sack, weigh it with the scale and ask the number of sacks sold; report final quantity in kg).  _ .  .   kg <input type="checkbox"/> sacks
--	---

**30. WHAT TYPE OF KILN WAS USED TO PRODUCE CHARCOAL?**

EARTH PIT .....	<input type="checkbox"/>	VENTILATED BRICK KILN .....	<input type="checkbox"/>
EARTH MOUND .....	<input type="checkbox"/>	VENTILATED STEEL KILN .....	<input type="checkbox"/>
CASAMANCE .....	<input type="checkbox"/>	PORTABLE STEEL KILN .....	<input type="checkbox"/>
OTHER TRADITIONAL KILN (_____ ) .....	<input type="checkbox"/>	OTHER IMPROVED KILN (_____ ) .....	<input type="checkbox"/>

**31. WAS THE WOOD USED TO PRODUCE CHARCOAL:**

**32. WHERE IS THE WOOD USED TO PRODUCE CHARCOAL MAINLY CUT?**

CUT BY A HOUSEHOLD MEMBER ( $\rightarrow$ Q. 32) ..... <input type="checkbox"/>	NATURAL FORESTS ..... <input type="checkbox"/> FOREST PLANTATION ..... <input type="checkbox"/> BUSH, RIVER BANKS ..... <input type="checkbox"/> OWN FARM ..... <input type="checkbox"/> OTHER AGRICULTURAL LAND ..... <input type="checkbox"/> URBAN/VILLAGE AREA, ROADSIDE ..... <input type="checkbox"/> OTHER ( _____ ) ..... <input type="checkbox"/>				
PURCHASED OR OTHERWISE ACQUIRED ( $\rightarrow$ Q. 34) . <input type="checkbox"/>					
BOTH ( $\rightarrow$ Q. 32) ..... <input type="checkbox"/>					
<b>33. WHAT IS THE <u>MAIN</u> WOOD SPECIES USED FOR PRODUCING CHARCOAL?</b> (Use local name of plants) ..... _____					
<b>34. WHICH HOUSEHOLD MEMBERS WERE USUALLY INVOLVED IN CHARCOAL PRODUCTION?</b> (Use codes in the household roster)					
<b>35. DID CHARCOAL PRODUCTION HAVE ANY OF THE FOLLOWING <u>NEGATIVE CONSEQUENCES</u> ON [NAME]?</b>					
	MISSED SCHOOL DAYS	SCHOOLING PROBLEMS	INJURIES, ILL- HEALTH	ASSAULTS, VIOLENCE	OTHER
1. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## S2C. CHARCOAL SALES

<b>36. IN THE LAST MONTH, DID YOU OR ANY MEMBER OF THE HOUSEHOLD <b>SELL</b> CHARCOAL?</b> Yes <input type="checkbox"/> $\rightarrow$ Q. 37 No <input type="checkbox"/> $\rightarrow$ Q. 40		
<b>37. HOW MANY SACKS WERE SOLD?</b> (in case charcoal was not weighed before, fill a sack, weigh it with the scale and ask the number of sacks sold; report final quantity in kg).  _ _ .   <input type="checkbox"/> kg <input type="checkbox"/> sacks	<b>38. WHAT WAS THE <u>MONTHLY INCOME</u> DERIVED BY YOUR HOUSEHOLD FROM CHARCOAL SALES? (in <b>local currency</b>)</b>  _ _ .   <u>Currency</u>	<b>39. TO WHOM DID YOUR HOUSEHOLD <u>MOSTLY</u> SELL CHARCOAL?</b> URBAN HOUSEHOLDS ..... <input type="checkbox"/> RURAL HOUSEHOLDS ..... <input type="checkbox"/> INDUSTRIAL PLANTS ..... <input type="checkbox"/> COMMERCIAL ACTIVITIES ..... <input type="checkbox"/> TRANSPORTERS, WHOLE SELLERS ..... <input type="checkbox"/> RETAILERS ..... <input type="checkbox"/> OTHER ( _____ ) ..... <input type="checkbox"/>

### S3. HOUSEHOLD FUEL COMBUSTION

<b>40. WHAT IS THE MAIN STOVE USED BY YOUR HOUSEHOLD FOR COOKING?</b>					
	<b>40A. ENERGY SOURCE</b> (Use codes)	<b>40B. MODEL (Name)</b>	<b>40C. LOCATION (Use codes)</b>	<b>40D. PRESENCE OF CHIMNEY, HOOD, WINDOW</b>	
THREE-STONE FIRE .....	<input type="checkbox"/>	..... <input type="checkbox"/> ..... _____	..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>	
MUD STOVE .....	<input type="checkbox"/>	..... <input type="checkbox"/> ..... _____	..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>	
CERAMIC STOVE .....	<input type="checkbox"/>	..... <input type="checkbox"/> ..... _____	..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>	
PRE-FABRICATED STOVE .....	<input type="checkbox"/>	..... <input type="checkbox"/> ..... _____	..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>	
NO STOVE / NO COOKING ...	<input type="checkbox"/>	..... <input type="checkbox"/> .....	..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>	
<b>41. WHAT DOES YOUR HOUSEHOLD MAINLY USE FOR HEATING SPACE?</b>					
	<b>41A. ENERGY SOURCE</b> (Use codes)	<b>41B. MODEL (Name)</b>	<b>41C. LOCATION (Use codes)</b>	<b>41D. PRESENCE OF CHIMNEY, HOOD, WINDOW</b>	
FIREPLACE .....	<input type="checkbox"/>	..... <input type="checkbox"/> .....	..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>	
OTHER TRADITIONAL HEATER...	<input type="checkbox"/>	..... <input type="checkbox"/> .....	..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>	
ELECTRIC HEATER .....	<input type="checkbox"/>	..... <input type="checkbox"/> .....	..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>	
GAS HEATER .....	<input type="checkbox"/>	..... <input type="checkbox"/> .....	..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>	
OTHER IMPROVED HEATER .....	<input type="checkbox"/>	..... <input type="checkbox"/> .....	..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>	
NO HEATING .....	<input type="checkbox"/>	..... <input type="checkbox"/> .....	..... <input type="checkbox"/> .....	Yes <input type="checkbox"/> No <input type="checkbox"/>	
<b>CODES FOR ENERGY SOURCE:</b> 1 = DUNG, CROP RESIDUES; 2 = FUELWOOD; 3 = CHARCOAL; 4 = GAS; <b>5 = ELECTRICITY; 6 = OTHER.</b> <b>MODEL:</b> see attached <b>stove card.</b>					
<b>CODES FOR LOCATION:</b> 1 = OUTDOOR; 2 = IN A SEPARATE BUILDING; 3 = INDOOR, IN THE LIVING AREA; 4 = INDOOR, IN A DEDICATED ROOM					
<b>42. DID FUEL COMBUSTION AT HOME CAUSE ON [NAME] ANY OF THE FOLLOWING HEALTH PROBLEMS?</b>					
	HEADACHES, NAUSEA	SKIN/EYE IRRITATIONS	SNEEZING, AL- LERGY, ASTHMA	BURNS, INJURIES	<b>43. FUEL USED WHEN PROBLEM AROSE</b>
1. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	... _____
2. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	... _____
3. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	... _____
4. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	... _____
5. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	... _____
6. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	... _____
7. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	... _____
8. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	... _____
9. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	... _____
10. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	... _____

### S4. WOOD SECURITY

<b>44. IN THE LAST 12 MONTHS, HAS YOUR HOUSEHOLD EXPERIENCED FUELWOOD OR CHARCOAL SHORTAGES? .....</b>				
Yes <input type="checkbox"/> → Q. 45				
No <input type="checkbox"/> → End				
<b>45. IN WHICH MONTH(S)? [select all that apply]</b>		<b>46. WHICH OF THE FOLLOWING ACTIVITIES WERE AFFECTED BY SUCH SHORTAGES? [select all that apply]</b>		
JANUARY	<input type="checkbox"/> MAY	<input type="checkbox"/> SEPTEMBER	<input type="checkbox"/>	COOKING ..... <input type="checkbox"/> AGRICULTURAL USES .. <input type="checkbox"/>
FEBRUARY	<input type="checkbox"/> JUNE	<input type="checkbox"/> OCTOBER	<input type="checkbox"/>	HEATING SPACE ..... <input type="checkbox"/> COMMERCIAL USES .... <input type="checkbox"/>
MARCH	<input type="checkbox"/> JULY	<input type="checkbox"/> NOVEMBER	<input type="checkbox"/>	OTHER DOMESTIC TASKS <input type="checkbox"/> OTHER USES ..... <input type="checkbox"/>
APRIL	<input type="checkbox"/> AUGUST	<input type="checkbox"/> DECEMBER	<input type="checkbox"/>	

# Annex 4

## The Household Energy Use (EU) module and the Child Labour (CL) module in the sixth round of the MICS

<b>EU1.</b> IN YOUR HOUSEHOLD, WHAT TYPE OF COOKSTOVE IS <u>MAINLY</u> USED FOR COOKING?	ELECTRIC STOVE .....01 SOLAR COOKER .....02 LIQUEFIED PETROLEUM GAS (LPG)/ COOKING GAS STOVE .....03 PIPED NATURAL GAS STOVE .....04 BIOGAS STOVE .....05  LIQUID FUEL STOVE .....06 MANUFACTURED SOLID FUEL STOVE.....07 TRADITIONAL SOLID FUEL STOVE .....08 THREE STONE STOVE / OPEN FIRE.....09  OTHER ( <i>specify</i> ) .....96  NO FOOD COOKED IN HOUSEHOLD .....97	01⇒EU5 02⇒EU5 03⇒EU5 04⇒EU5 05⇒EU5  06⇒EU4  09⇒EU4  96⇒EU4  97⇒EU6
<b>EU2.</b> DOES IT HAVE A CHIMNEY?	YES .....1 NO .....2 DK .....8	
<b>EU3.</b> DOES IT HAVE A FAN?	YES .....1 NO .....2 DK .....8	
<b>EU4.</b> WHAT TYPE OF FUEL OR ENERGY SOURCE IS USED IN THIS COOKSTOVE?  <i>IF MORE THAN ONE, CIRCLE THE MAIN ENERGY SOURCE FOR THIS COOKSTOVE.</i>	ALCOHOL / ETHANOL .....01 GASOLINE / DIESEL .....02 KEROSENE / PARAFFIN.....03 COAL / LIGNITE .....04 CHARCOAL.....05 WOOD.....06 CROP RESIDUE / GRASS / STRAW / SHRUBS.....07 ANIMAL DUNG / WASTE .....08 PROCESSED BIOMASS (PELLETS) OR WOODCHIPS.....09 GARBAGE / PLASTIC.....10 SAWDUST .....11  OTHER ( <i>specify</i> ) .....96	

<p><b>EU5.</b> IS THE COOKING USUALLY DONE IN THE HOUSE, IN A SEPARATE BUILDING, OR OUTDOORS?</p> <p><i>IF IN MAIN HOUSE, PROBE TO DETERMINE IF COOKING IS DONE IN A SEPARATE ROOM.</i></p> <p><i>IF OUTDOORS, PROBE TO DETERMINE IF COOKING IS DONE ON VERANDA, COVERED PORCH, OR OPEN AIR.</i></p>	<p>IN MAIN HOUSE</p> <p>NO SEPARATE ROOM.....1</p> <p>IN A SEPARATE ROOM .....2</p> <p>IN A SEPARATE BUILDING .....3</p> <p>OUTDOORS</p> <p>OPEN AIR .....4</p> <p>ON VERANDA OR COVERED PORCH .....5</p> <p>OTHER (<i>specify</i>) .....6</p>	
<p><b>EU6.</b> WHAT DOES YOUR HOUSEHOLD <u>MAINLY</u> USE FOR <u>SPACE HEATING</u> WHEN NEEDED?</p>	<p>CENTRAL HEATING .....01</p> <p>MANUFACTURED SPACE HEATER.....02</p> <p>TRADITIONAL SPACE HEATER .....03</p> <p>MANUFACTURED COOKSTOVE.....04</p> <p>TRADITIONAL COOKSTOVE .....05</p> <p>THREE STONE STOVE / OPEN FIRE.....06</p> <p>OTHER (<i>specify</i>) .....96</p> <p>NO SPACE HEATING IN HOUSEHOLD .....97</p>	<p>01⇒EU8</p> <p>02⇒EU8</p> <p>03⇒EU8</p> <p>04⇒EU8</p> <p>05⇒EU8</p> <p>06⇒EU8</p> <p>96⇒EU8</p> <p>97⇒EU9</p>
<p><b>EU7.</b> DOES IT HAVE A CHIMNEY?</p>	<p>YES .....1</p> <p>NO .....2</p> <p>DK .....8</p>	

<b>EU8.</b> WHAT TYPE OF FUEL AND ENERGY SOURCE IS USED IN THIS HEATER?  <i>IF MORE THAN ONE, CIRCLE THE MAIN ENERGY SOURCE FOR THIS HEATER.</i>	SOLAR AIR HEATER ..... 01 ELECTRICITY ..... 02 PIPED NATURAL GAS ..... 03 LIQUEFIED PETROLEUM GAS (LPG)/ COOKING GAS ..... 04 BIOGAS ..... 05 ALCOHOL / ETHANOL ..... 06 GASOLINE / DIESEL ..... 07 KEROSENE / PARAFFIN ..... 08 COAL / LIGNITE ..... 09 CHARCOAL ..... 10 WOOD ..... 11 CROP RESIDUE / GRASS / STRAW / SHRUBS ..... 12 ANIMAL DUNG / WASTE ..... 13 PROCESSED BIOMASS (PELLETS) OR WOODCHIPS ..... 14 GARBAGE / PLASTIC ..... 15 SAWDUST ..... 16  OTHER ( <i>specify</i> ) ..... 96	
<b>EU9.</b> AT NIGHT, WHAT DOES YOUR HOUSEHOLD <u>MAINLY</u> USE TO <u>LIGHT</u> THE HOUSEHOLD?	ELECTRICITY ..... 01 SOLAR LANTERN ..... 02 RECHARGEABLE FLASHLIGHT, TORCH OR LANTERN ..... 03 BATTERY POWERED FLASHLIGHT, TORCH OR LANTERN ..... 04 BIOGAS LAMP ..... 05 GASOLINE LAMP ..... 06  KEROSENE OR PARAFFIN LAMP ..... 07 CHARCOAL ..... 08 WOOD ..... 09 CROP RESIDUE / GRASS / STRAW / SHRUBS ..... 10 ANIMAL DUNG / WASTE ..... 11 OIL LAMP ..... 12 CANDLE ..... 13  OTHER ( <i>specify</i> ) ..... 96  NO LIGHTING IN HOUSEHOLD ..... 97	

<b>CL9.</b> Since last ( <i>day of the week</i> ), did ( <i>name</i> ) collect firewood for household use?	YES .....1 NO .....2	2⇒CL11
<b>CL10.</b> In total, how many hours did ( <i>name</i> ) spend on collecting firewood for household use, since last ( <i>day of the week</i> )?  <i>If less than one hour, record '00'.</i>	NUMBER OF HOURS ..... ____	
<b>CL11.</b> Since last ( <i>day of the week</i> ), did ( <i>name</i> ) do any of the following for this household?  [A] Shopping for the household? [B] Cooking? [C] Washing dishes or cleaning around the house? [D] Washing clothes? [E] Caring for children? [F] Caring for someone old or sick? [X] Other household tasks?	YES NO SHOPPING FOR HOUSEHOLD ..... 1    2 COOKING ..... 1    2 WASHING DISHES / CLEANING HOUSE ..... 1    2 WASHING CLOTHES ..... 1    2 CARING FOR CHILDREN ..... 1    2 CARING FOR OLD / SICK ..... 1    2 OTHER HOUSEHOLD TASKS ..... 1    2	
<b>CL12.</b> Check CL11, [A]-[X]:	AT LEAST ONE 'YES' ..... 1 ALL ANSWERS ARE 'NO' ..... 2	2⇒End

<p><b>CL13. SINCE LAST (DAY OF THE WEEK), ABOUT HOW MANY HOURS DID (NAME) ENGAGE IN (THIS ACTIVITY/THESE ACTIVITIES), IN TOTAL?</b></p> <p><b>IF LESS THAN ONE HOUR, RECORD '00'</b></p>	<p>NUMBER OF HOURS ..... — —</p>	
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# Annex 5

## The Energy Use module of the Uganda NPS 2011/12

Which of the following types of stoves are used by this household?  A = Electric B = LPG C = Kerosene D = Wood/Sawdust burning E = Efficient wood burning F = Charcoal G = Other biomass burning H = Open fire I = Other (Specify) J = None	Which is the stove used <u>most often</u> by this household?  1= Electric 2= LPG 3= Kerosene 4= Wood/Sawdust burning 5= Efficient wood burning 6= Charcoal 7= Other biomass burning 8= Open fire 9= Other (Specify)	Does this [MAIN STOVE] have a chimney?  1=Yes 2=No	Approximately how many hours a day is the [MAIN STOVE] in use (burning/on) by the household?	Where is the [MAIN STOVE] located?  1=In a separate kitchen 2=In a room in the dwelling not just devoted to cooking 3=in an outdoor space
			HOURS	
8	9	10	11	12

F U E L  I D	Does your household use [FUEL]?  1=Yes 2=No <b>(&gt;&gt; NEXT FUEL)</b>	Do you use this [FUEL] for:			Where do you get most of [FUEL]?  1=Purchase from shop 2=Purchase from marketplace 3=Purchase from public utility 4=Purchase on the black market 5=Gather/collect from own land 6=Gather/collect from village	How much did your household pay for the [FUEL] used in the last month?  <b>[&gt;&gt; NEXT FUEL]</b>		
		a) Cooking	b) Lighting	c) Heating		SHILLINGS	QUANTITY	UNIT OF MEASURE 1=kg 2=Liter 3=Bundle 8=Other
<b>13</b>	<b>14</b>	<b>15A</b>	<b>15B</b>	<b>15C</b>	<b>16</b>	<b>17A</b>	<b>17B</b>	<b>17C</b>
1	Firewood							
2	Dung							
3	Crop residue							
4	Kerosene							
5	LPG							
6	Charcoal							
7	Solar							
8	Electricity							

# Annex 6

## Sampling and Data Analysis: an Overview

**Sampling** is the methodology by which specific individuals, households, communities or other units of observation are selected from a population of interest to collect quantitative or qualitative information without having to gather data on the entire population. It reduces the amount of time and resources needed to undertake the study.<sup>75</sup>

There are two main types of sampling: probability sampling and non-probability sampling. In probability sampling each unit of analysis in the population of interest is given a probability of being chosen that is positive and known. This makes it possible to make inferences from a randomly selected sample of individual units of analysis – denoted as  $n$  – to the entire population of interest – denoted as  $N$  – with known margins of error.

A typical probability sampling strategy includes the following steps:

- a. Decide the unit of observation; for example: the household.
- b. Construct a sampling frame; for example: list (or map) of the households in a village, or of the villages in a country;
- c. Decide the sampling unit; for example: a village, or a household;
- d. Determine the universe; for example: all the households from country A, or from the rural part of country A;
- e. Choose the type of (probability) sampling;
- f. Decide on the sample size ( $n$ ).

In household surveys, the household is the unit of observation. When a complete list of households and their locations is available, the household is also the primary sampling unit (PSU), namely the sampling unit that is selected in the first (primary) stage of a multi-stage sample. When such a list is unavailable, households can be selected within clusters for which accurate information on the existence, location and relative size is available.<sup>76</sup>

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<sup>75</sup> The major entity that is being analysed in a study.

<sup>76</sup> For instance: a village in rural areas; a block or a building in urban areas. In some cases, all the households of a selected cluster can be included in the final sample.

A sampling frame is an ideally exhaustive list of all sampling units – and their physical locations – within the population of interest.<sup>77</sup> It is built to ensure that each household of the population of interest has a known probability of being randomly selected for inclusion in a survey sample, allowing for the generalization of the estimates obtained from the sample to the entire population.<sup>78</sup> In practice, a perfect coverage and accuracy of the sampling frame is difficult to get; what is important is to be transparent about groups or areas that are intentionally left out of the sampling frame because population-level estimates generated by the sample do not apply to these groups or areas. In some cases, nonetheless, some groups or areas are omitted from the sampling frame unintentionally (WFP, 2009).

There are many types of probability sampling, including, among them: (a) simple random sampling; (b) stratified random sampling; (c) stratified two-stage cluster sampling; and (d) multi-stage sampling.

Simple random sampling involves the random selection of households from a complete list of households of the population. The selection implies the following four steps: (a) each household in the sampling frame is assigned a unique number; (b) a randomization method is used<sup>79</sup> to select households for inclusion in the sample; (c) selected households are mapped; and (d) replacement strategies<sup>80</sup> are adopted in case a household cannot be located or an appropriate respondent is not available. This type of sampling has the advantage of requiring small sample sizes – approximately half the size required for cluster or two-stage cluster sampling – although an exhaustive population list is required, which implies higher costs associated with visiting geographically dispersed households World Food Programme (WFP, 2009).<sup>81</sup>

Stratified random sampling involves dividing the population of interest into subgroups called strata that are homogeneous based on criteria related to the objective of the assessment.<sup>82</sup> The aim is to increase the overall precision<sup>83</sup> of

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<sup>77</sup> For instance: data from the census of population.

<sup>78</sup> For more details on building sampling frames see chapter 5 of UNSD (2005a).

<sup>79</sup> Through Microsoft Excel, Stata, SPSS or other statistical software.

<sup>80</sup> Such as: the next closest household.

<sup>81</sup> By comparison, cluster and two-stage cluster sampling limit the number of villages to be visited, presenting a logistic advantage, especially when the area being covered by the assessment is large.

<sup>82</sup> For example: livelihood zones and land-use zones in a survey on food security.

<sup>83</sup> Precision can be defined as “the closeness with which a sample statistics can be expected to approximate the relevant population value”. It is the inverse of the variance of an estimator, assuming that the information collected in the survey is correct. The standard error, or square root of the variance, is another commonly used measure of the sampling error. It is easier to interpret as it provides an indication of the sampling error using the same scale as the estimate, while the variance is based on square differences (UNSD, 2005b). See section 6 for addressing

estimates derived from the sample, especially when subnational estimates are desired at a pre-defined minimum level of precision for each of these subgroups. Stratification by administrative boundaries, for instance, allows for the generation of separate estimates for different administrative areas.<sup>84</sup>

Stratified two-stage cluster sampling combines the two advantages of minimum information requirements and logistical ease. Even when a complete sampling frame of households is available, compared to the simple random sampling, this method reduces the number of villages to be visited and consequently the financial cost and time needed for an assessment. For most assessments, however, the required sample size is about twice that required for simple random sampling (WFP, 2009).

Once overall sampling requirements have been determined, this sampling method involves four steps: (a) the definition of strata; (b) the definition of clusters and the construction of sampling frames; (c) the selection of a number of clusters in each defined stratum for inclusion in the sample; and (d) the selection of a fixed number of households within each cluster. A cluster is defined as any aggregation of households that can be unambiguously defined, such as villages in rural areas and neighbourhoods or blocks in urban areas. As opposed to stratification, aggregation criteria used for clusters should be as unrelated as possible to the variables under observation (heterogeneity). For instance, if the aim of the survey is to analyse wood consumption, clusters should be selected in such a way that the households they contain reflect the same diversity of wood consumption as the one that could be found in the entire population of interest. Clusters correspond to the PSUs of the survey, the list of which constitutes the sampling frame. Therefore, with this sampling technique a complete list of villages or neighbourhoods is required, rather than of households. It is to be noted that a separate sampling frame must be developed for each stratum. The choice of the number of stages, clusters and households per cluster to be chosen depends on three main factors:

- a. The magnitude of the cluster sampling Design effect (D);
- b. The number of households in a given cluster of the site, which may place a limit on how large the per-cluster sample could potentially be;
- c. The resources available to undertake the survey fieldwork.<sup>85</sup>

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sampling errors in data analysis. For further details see: Cochran (1977), Magnani (1997), UNSD (2005a and 2005b).

<sup>84</sup> For example, a national sample may be stratified by district in order to ensure the precision of estimates at the district level for comparative purposes.

<sup>85</sup> Transporting and sustaining field staff and supervisors constitute the major costs, and these heavily depend on the number of clusters to be covered.

The Design effect ( $D_{eff}$ ) can be defined as the number of times by which the minimum sample size should be multiplied to obtain the same level of precision obtained with a simple random sample.<sup>86</sup> The smaller the number of households per cluster, the less pronounced the ( $D_{eff}$ ) and the higher the precision of estimates. This is because elementary units within clusters tend to exhibit some degree of homogeneity (WFP, 2009). Increasing the number of cluster and decreasing the size of each cluster is a preferable option, as it decreases the ( $D_{eff}$ ) with a constraint sample size. Cluster population figures are generally used to select clusters with a Probability Proportional to Size (PPS), meaning that larger clusters have a higher probability of selection. If official population figures are unavailable, key informants can be used to provide rough estimates.

Several options exist for selecting households within selected clusters. The ideal option would be to construct a sampling frame of all the households located in the selected clusters and then extract a sample using the simple random sampling or the systematic random sampling.

Multi-stage sampling is an extension of the two-stage random sampling, for instance:

Stage 1: Random selection of districts;

Stage 2: Random or systematic selection of villages within selected districts;

Stage 3: Random selection of households within selected villages.

This may be necessary when, for instance, accurate information is available only at the district level. However, the ( $D_{eff}$ ) – and hence the sample size requirements – increases considerably with each additional sampling stage, causing population estimates to be less precise.

The size of the sample is perhaps the most important parameter of the sample design because it affects the precision, cost and duration of the survey more than any other factor. Sample size must be considered in terms of both the available budget (and time) for the survey and its precision requirements. The latter must be further considered in terms of the requirements for national versus subnational estimates. It is to be noted that the overall sample size cannot be considered independently of the number of primary sampling units and the size of the ultimate clusters. So, while there are mathematical formulas<sup>87</sup> to calculate the sample size, it is necessary to take into account all these factors in making the

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<sup>86</sup> For which  $D = 1$ .

<sup>87</sup> The choice of the sample size formula depends on whether the key-indicator(s) of interest is expressed as percentage or as a mean value. Sample size calculation provides the ideal sample size required to meet the objectives of the assessment. Knowing this is critical to understand the consequences of deviating from the ideal situation and allows for informed choices to be made.

final decision (UNICEF, 2005). The size of the population does not affect substantially the choice of the size, unless it is very small: in that case a “finite population adjustment” is required.

The formula for calculating the sample size for assessments when the key indicator is expressed as percentage is:

$$n = \frac{D z^2 p (1 - p)}{d^2}$$

Where:

$n$  = Minimum required sample size;

$D$  = Design effect;

$z$  = z-score corresponding to the degree of confidence;<sup>88</sup>

$p$  = Estimated proportion of the key indicator, expressed as a decimal;<sup>89</sup>

$d$  = Maximum tolerable error (or: minimum desired precision), expressed in decimal form.<sup>90</sup>

The Design effect is often assumed to be equal to two, resulting in a doubling of the sample size requirement compared to the simple random sampling, but it varies by type of sampling and by indicator and can only be computed *ex-post*<sup>91</sup> with the following formula:

$$D_{\text{eff}} = 1 + (m - 1) \rho$$

Where:

$m$  = number of observations in each cluster; and

$\rho$  = intra-cluster correlation.

It is to be noted that the minimum required sample size should be calculated for each *domain*, namely, for each geographic stratum for which an estimate will be

<sup>88</sup> 1.96 for degree of confidence of 95 percent; 2.576 for degree of confidence of 99 percent. Because estimates are based on a sample rather than total population, it is not possible to be 100 percent confident that the obtained estimate is a reflection of the unobserved true value that would be drawn from the population. The conventional degree of confidence for most social research is 95 percent, meaning that if the assessment were to be carried out 100 times, 95 assessments would yield range estimates containing the true population proportion, while the other five assessments would yield confidence intervals that do not contain the true proportion due to chance.

<sup>89</sup> For example: 20 percent = 0.20.

<sup>90</sup> For example: +/- 5 percent = .05. Precision refers to the degree of error around the estimate due to the fact that the estimate is based on a sample.

<sup>91</sup> See section 5.

produced in the final report. This should be carefully considered when planning the survey, as an increase in the number of domains will cause an increase in the minimum required sample size. Also, where cluster sampling is adopted, the sample size of each stratum should be a multiple of the number of observations in each cluster. The final sample size is also affected by non-response. If, for instance, a 90 percent response rate is expected,<sup>92</sup> then the sample size will have to be adjusted by 1.10 (Tango, 2007).

## **Data analysis**

The sampling strategy adopted must be taken into account in analysing the data collected. Cluster sampling, for instance, produces a less precise estimate than a simple random sample because households in the same cluster are often similar to each other.<sup>93</sup> For example, 20 households from two villages reasonably show a lower variance than 20 households from different villages. The more households coming from the same cluster – and the higher intracluster correlation – the higher the Design effect.

The most important effect of a complex sampling design is the need of weighing. If each household in the sample has an equal probability of being selected, then no weighing system is required.<sup>94</sup> If this is not the case, then a weighting system needs to be used to compensate for the unequal probabilities of a household being included in the sample and to generalize the results to the entire population of interest (WFP, 2009).

Design weights can be defined as *the inverse of the probability that a household could be selected*, or alternatively *the number of households represented by each sampled household in a substratum*, according to the following formula:

$$W_s = N_s/n_s$$

Where:

$W_s$  is the design weight in a sampling stratum  $s$ ;

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<sup>92</sup> Due to, for example, absence of respondent, inability of respondent to complete the interview or refusal to participate in the survey.

<sup>93</sup> Intracluster correlation.

<sup>94</sup> For example: simple random sampling using a sample frame with a 100 percent coverage of the population.

$N_s$  is the total number of households<sup>95</sup> in the sampling stratum  $s$ ; and

$n_s$  is the sample size of the sampling stratum  $s$ .

If, for example, the same number of households is sampled in all strata, but each stratum has a different population, weights have to be “normalized” to correct for this unequal sampling probability across strata in the following way:

$$w_s = (N_s/N)/(n_s/n)$$

Where:

$w_s$  is the normalized weight for a sampling stratum  $s$ ;

$N_s/N$  is the proportion of all households living in sampling stratum  $s$ ; and

$n_s/n$  is the proportion of sampled households coming from stratum  $s$ .

If, for instance, the proportion of sampled households coming from a stratum  $s$  - the denominator in the above formula – is higher than the proportion of total population living in the same stratum – the numerator – then the normalized weight  $w_s$  assumes a value lower than 1 (and vice versa). Multiplying this value by the design weight, the weighed number of households for each stratum is obtained. These weights can then be used to obtain estimates at the population – rather than the sample – level.

With regard to the main types of survey analysed in this report, they typically use a two-stage cluster sampling design, implying the selection of villages in the first stage and of households within the selected villages in the second stage. To meet the objectives of the WSM, a third stage is added to the sampling procedure in which only some of the households selected in each cluster are included in the sub-sample that will receive the complete woodfuel module. The resulting design effect should then be taken into account during analysis, particularly when calculating significance, standard deviations, standard variations and confidence intervals.<sup>96</sup> Assuming constant sample size,  $deff$  is influenced by the number of observations in each cluster and the intracluster correlation. A higher number of clusters each of small size results in lower Design effect, although it

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<sup>95</sup> The number of households – or the population – could come from a recent census, other surveys, or Landsat information using GIS techniques to estimate the population by geographic area.

<sup>96</sup> Compensating for clusters in analysis does not alter point estimates, but it widens confidence intervals and variations. If, on the contrary, the clusters are not accounted for, it should be reported in the methodology that any confidence interval reported is likely to be wider, and that the statistical tests may indicate significance when in fact there is none.

should be reminded that  $d_{eff}$  should be calculated for each indicator (WFP, 2009).

Testing the statistical significance of observed differences – for example, in woodfuel consumption between urban and rural areas – requires estimates of the magnitude of sampling error associated with the survey estimates, commonly referred to as standard errors (Magnani, 1997).

Sampling errors may be presented in three different forms: (a) as absolute values of standard errors; (b) as relative standard errors (squared roots of relative variances); and (c) as confidence intervals<sup>97</sup> (UNSD, 2005b). The choice depends on the nature of the estimate. In general, absolute standard errors are much easier to understand and to relate to the estimate, especially in the case of percentages, proportions and rates. Using confidence intervals requires the choice of a confidence level (for example 90, 95 or 99 percent) that hence should be explicitly specified. The interval most frequently used in practice is 95 percent confidence interval, that is:

$$\text{Estimate} \pm 1.96 \times \text{Standard Error.}$$

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<sup>97</sup> The chances for the true value of an indicator being within  $\pm 2\sigma$  from its sampling estimate are about 95 percent.

# Annex 7

## Wood toxicity by plant species

Wood Species	Reaction	Area(s) affected	Potency (1-4)
<a href="#">Abura</a>	Irritant, nausea, giddiness, and vomiting	Eyes	2
<a href="#">African Blackwood</a>	Irritant, sensitizer	Hands, eyes, lungs	3
<a href="#">African Boxwood</a>	Irritant, headache, asthma	Hands, lungs	.
<a href="#">Afrormosia</a>	Irritant, nervous system effects, asthma, splinters go septic	Hands, eyes, lungs	3
<a href="#">Afzelia</a>	Irritant, sneezing	Hands, eyes, lungs	2
<a href="#">Agba</a>	Irritant	Hands	.
<a href="#">Ailanthus</a>	Irritant	Hands	1
<a href="#">Albizia</a>	Irritant, nausea, pink eye, giddiness, nose bleeds	Hands, eyes, lungs	3
<a href="#">Alder (<i>Alnus spp.</i>)</a>	Irritant	Hands, eyes, lungs	1
<a href="#">Alligator Juniper</a>	Irritant	Hands, lungs	3
<a href="#">Alpine Ash</a>	Irritant	Eyes, lungs	.
<a href="#">Amboyna</a>	Irritant, asthma	Hands, lungs	.
<a href="#">Andiroba</a>	Irritant, sneezing	Hands, eyes, lungs	2
<a href="#">Aracanga</a>	Irritant, asthma	Hands, lungs	3
<a href="#">Ash (<i>Fraxinus spp.</i>)</a>	Irritant	Hands, lungs	2
<a href="#">Ash, Mountain</a>	Irritant	Hands, eyes, lungs	2
<a href="#">Australian Blackwood</a>	Irritant, sensitizer, asthma	Hands, eyes, lungs	2
<a href="#">Australian Cashew Nut</a>	Irritant, skin lesions, nosebleeds	Hands, eyes, lungs	4
<a href="#">Avodire</a>	Irritant, nose bleeds, internal bleeding, asthma	Hands, lungs	3
<a href="#">Balsa</a>	Irritant	Hands	1
<a href="#">Bamboo</a>	Irritant	Hands	1
<a href="#">Birch (<i>Betula spp.</i>)</a>	Irritant, sensitizer, nausea	Hands, lungs	2
<a href="#">Black Cherry</a>	Wheezing, giddiness	Lungs	1
<a href="#">Black Locust</a>	Irritant, nausea	Hands, eyes	3
<a href="#">Blackbean</a>	Irritant	Hands, eyes, lungs	.
<a href="#">Bloodwood</a>	Irritant, excessive thirst, salivation, Nausea	Hands	2
<a href="#">Bloodwood, Red (Australian)</a>	Irritant	Hands, eyes	2
<a href="#">Blue Gum</a>	Irritant	Hands	1
<a href="#">Blue Mahoe</a>	Sneezing	Lungs	1
<a href="#">Bocote</a>	Cross reactions possible once sensitivity to other woods have developed	Hands	2
<a href="#">Bosse</a>	Irritant, sensitizer, asthma, nausea, headache	Hands, eyes, lungs	4

Wood Species	Reaction	Area(s) affected	Potency (1-4)
<a href="#">Box, White</a>	Irritant, rash	Hands, eyes	1
<a href="#">Boxwood</a>	Irritant, sensitizer	Hands, eyes, lungs	2
<a href="#">Brazilwood</a>	Irritant, headache, nausea, swelling skin, blisters	Hands	2
Brigalow ( <i>Acacia harpophylla</i> )	Irritant	Hands	.
<a href="#">Brownheart</a>	Irritant	Hands	2
<a href="#">Bubinga</a>	Irritant, lesions	Hands	.
<a href="#">Buckthorn</a>	Irritant, sap can cause dermatitis	Hands	2
<a href="#">Bulletwood</a>	Irritant	Hands	2
<a href="#">Camphor</a>	Irritant, asthma, headaches, giddiness	Hands, lungs	2
<a href="#">Cashew</a>	Irritant, sensitizer	Hands	1
<a href="#">Catalpa</a>	Irritant	Hands	1
<a href="#">Cedar, Alaskan Yellow</a>	Irritant	Hands	1
<a href="#">Cedar, Aromatic Red</a>	Irritant	Hands, lungs	3
<a href="#">Cedar, Atlantic White</a>	Irritant	Hands	1
<a href="#">Cedar, Australian Red</a>	Irritant, asthma, migraine, giddiness, bronchitis, stomach cramps, NPC (rare)	Hands, lungs	3
<a href="#">Cedar, Incense</a>	irritant, rashes	Hands	3
<a href="#">Cedar of Lebanon</a>	Irritant, asthma, runny nose, respiratory disorders	Hands, lungs	3
<a href="#">Cedar, Northern White</a>	Irritant, asthma	Hands, lungs	2
<a href="#">Cedar, Port Orford</a>	Irritant, runny nose, asthma, kidney problems (diuresis)	Hands, lungs	3
<a href="#">Cedar, Spanish</a>	Irritant	Lungs	2
<a href="#">Cedar, Southern Red</a>	Irritant	Hands, lungs	3
<a href="#">Cedar, Western Red</a>	Irritant, sensitizer, runny nose, asthma, nervous system effects, NPC (rare)	Hands, eyes, lungs	4
<a href="#">Chechen</a>	Irritant, sensitizer	Hands, eyes, lungs	3
Chestnut, Chinese ( <i>Castanea mollissima</i> )	Irritant	Hands	2
<a href="#">Chestnut, Sweet</a>	Irritant, sensitizer	Hands	3
<a href="#">Chico Zapote</a>	Irritant (nasal)	Lungs	3
<a href="#">Chinaberry</a>	Irritant, headaches	Hands, lungs	2
<a href="#">Cocobolo</a>	Irritant, sensitizer, nausea, asthma, pink eye	Hands, eyes, lungs	4
<a href="#">Cocuswood</a>	Irritant	Hands	2
<a href="#">Coolibah</a>	Irritant	Hands	1
<a href="#">Copaiá</a>	Irritant	Hands	.
<a href="#">Crow's Ash</a>	Irritant	Hands	.
<a href="#">Cuban Mahogany</a>	Irritant	Hands	1
<a href="#">Cypress</a>	Sensitizer	Lungs	1

<a href="#">Cypress, Australian</a>	Irritant, asthma, swelling of eyelids, boils, NPC (rare)	Hands, eyes, lungs	2
<a href="#">Cypress, Gowen</a>	Irritant	Hands	2
Wood Species	Reaction	Area(s) affected	Potency (1-4)
<a href="#">Cypress, Leyland</a>	Irritant	Hands	2
<a href="#">Cypress, Mediterranean</a>	Irritant, rashes, headaches	Hands	3
<a href="#">Cypress, Mexican</a>	Irritant	Hands	2
<a href="#">Cypress, Monterey</a>	Irritant	Hands	2
<a href="#">Dahomea</a>	Irritant, sensitizer	Hands, eyes, lungs	3
Dead Finish ( <i>Acacia tetragonophylla</i> )	Irritant, splinters go septic	Hands	.
<a href="#">Djohar</a>	Irritant, skin discoloration, keratitis	Hands, eyes	.
<a href="#">Douglas-fir</a>	Irritant, giddiness, runny nose, splinters go septic, nausea	Hands, eyes, lungs	1
<a href="#">Ebony (<i>Diospyros spp.</i>)</a>	Irritant, sensitizer, pink eye	Hands, eyes, lungs	3
<a href="#">Ebony, Brown</a>	Irritant	Hands	2
<a href="#">Ebony, Macassar</a>	Irritant, sensitizer	Hands	3
<a href="#">Ekki</a>	Irritant	Hands	2
<a href="#">Elm (<i>Ulmus spp.</i>)</a>	Irritant, sensitizer, NPC (rare)	Hands, eyes	1
<a href="#">European Beech</a>	Irritant, sensitizer, NPC (rare)	Hands, eyes, lungs	2
<a href="#">Eyoum</a>	Irritant	Hands, lungs	.
<a href="#">Fir (<i>Abies spp.</i>)</a>	Irritant	Hands	1
<a href="#">Fir, Balsam</a>	Irritant	Hands	2
<a href="#">Freijo</a>	Irritant, sensitizer, dryness/thirst	Hands	2
<a href="#">Garapa</a>	Irritant	Hands	2
<a href="#">Gedu Nohor</a>	Irritant	Hands	.
<a href="#">Goncalo Alves</a>	Sensitizer	Hands, eyes	2
<a href="#">Grasstree</a>	Irritant	Hands	.
<a href="#">Greenheart</a>	Sensitizer, wheezing, severe throat irritation, splinters go septic, cardiac and intestinal disorders	Hands, eyes, lungs, Hearth	3
<a href="#">Guanacaste</a>	Irritant	Eyes, lungs	3
<a href="#">Gum, Lemon-Scented</a>	Irritant	Hands	1
<a href="#">Gum, Spotted</a>	Irritant, rashes	Hands	1
<a href="#">Gum, Yellow</a>	Irritant	Hands, lungs	1
<a href="#">Hackberry</a>	Irritant	Hands	2
<a href="#">Hemlock, Eastern</a>	Irritant	Hands	1
<a href="#">Hemlock, Mountain</a>	Irritant	Hands	1
<a href="#">Hemlock, Western</a>	Irritant, runny nose, NPC (rare)	Hands, lungs	1
<a href="#">Hophornbeam</a>	Irritant	Hands	1
<a href="#">Hornbeam (<i>Carpinus spp.</i>)</a>	Irritant	Hands	2
<a href="#">Idigbo</a>	Irritant	Hands, lungs	.
<a href="#">Imbuia</a>	Irritant	Hands, lungs	2
<a href="#">Indian Beech</a>	Irritant	Hands, lungs	.
<a href="#">Indian Laurel</a>	Irritant	Hands	2
<a href="#">Ipe</a>	Irritant, headache, asthma, vision effects	Hands, eyes, lungs	3

<u>Iroko</u>	Irritant, sensitizer, asthma, boils, giddiness, HP	Hands, eyes, lungs	3
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Wood Species	Reaction	Area(s) affected	Potency (1-4)
<a href="#">Ironwood, Desert</a>	Irritant, sneezing, coughing	Lungs	3
<a href="#">Jacareuba</a>	Irritant, fainting, insomnia, kidney damage	Hands, lungs	.
<a href="#">Jarrah</a>	Irritant	Eyes, lungs	.
<a href="#">Jatoba</a>	Irritant	Hands	.
<a href="#">Jelutong</a>	Irritant	Hands	1
Juniper, Phoenician ( <i>Juniperus phoenicea</i> )	Irritant, headache, nausea	Hands	.
<a href="#">Karri</a>	Irritant	Hands	1
<a href="#">Katalox</a>	Irritant	Hands, lungs	3
<a href="#">Keruing</a>	Irritant	Hands	1
<a href="#">Kingwood</a>	Irritant, sensitizer, pink eye	Hands, eyes, lungs	3
<a href="#">Koto</a>	Irritant	Hands	1
<a href="#">Laburnum</a>	Constitutional effects (nausea, vomiting, headaches); direct toxin		2
<a href="#">Lacewood</a>	Irritant	Hands	.
<a href="#">Larch (<i>Larix spp.</i>)</a>	Irritant, hives, lesions	Hands	1
<a href="#">Leadwood (<i>Combretum spp.</i>)</a>	Irritant	Hands	1
<a href="#">Lebbeck</a>	Irritant	Eyes, lungs	3
<a href="#">Lignum Vitae</a>	Irritant	Hands	.
<a href="#">Limba</a>	Irritant, hives, splinters go septic, asthma, bleeding of the nose and gums	Hands, lungs	.
<a href="#">Machiche</a>	Irritant	Hands	2
<a href="#">Magnolia (<i>Magnolia spp.</i>)</a>	Asthma, runny nose	Lungs	1
<a href="#">Mahogany, African</a>	Irritant, sensitizer, NPC (rare)	Hands, lungs	3
Mahogany, Honduras	Irritant, sensitizer, boils, nausea, giddiness, asthma, HP	Hands, eyes, lungs	1
<a href="#">Mahogany, Santos</a>	Irritant	Hands, lungs	2
<a href="#">Makore</a>	Irritant, nausea, headache, giddiness, nervous system and blood effects	Hands, eyes, lungs	3
<a href="#">Mango</a>	irritant	Hands	2
<a href="#">Mansonia</a>	Irritant, sensitizer, nausea, sneezing, headaches, nosebleeds, splinters go septic, asthma, giddiness, cardiac disorders	Hands, eyes, lungs, heart	3
<a href="#">Maple (<i>Acer spp.</i>)</a>	Irritant, sensitizer, asthma; HP in spalted maple	Hands, lungs	3
<a href="#">Maple, Queensland</a>	Irritant	Hands, lungs	2
<a href="#">Marupa</a>	Irritant	Lungs	.
<a href="#">Meranti (<i>Shorea spp.</i>)</a>	Irritant	Hands, eyes, lungs	.
<a href="#">Merbau</a>	Irritant	Hands, lungs	.
<a href="#">Mesquite (<i>Prosopis spp.</i>)</a>	Irritant	Hands	2
<a href="#">Messmate</a>	Irritant, asthma	Hands, lungs	1

Wood Species	Reaction	Area(s) affected	Potency (1-4)
<a href="#"><u>Milky Mangrove</u></a>	Sap is poisonous, causes irritation to eyes and/or temporary blindness, headache, burning of throat, blistering of skin	Hands, eyes,lLungs	4
<a href="#"><u>Mimosa</u></a>	Irritant	Lungs	4
<a href="#"><u>Missanda</u></a>	Irritant, headache, giddiness, nausea, disorders of bowels and stomach	Lungs	.
<a href="#"><u>Moabi</u></a>	Irritant (mucous membranes)	Eyes, lungs	2
<a href="#"><u>Molopangady</u></a>	Irritant, sores	Hands	.
<a href="#"><u>Monkeypod</u></a>	Irritant	Eyes	1
<a href="#"><u>Mora</u></a>	Irritant	Lungs	1
<a href="#"><u>Movingui</u></a>	Irritant	Hands	2
<a href="#"><u>Muhuhu</u></a>	Irritant	Hands	.
Mulga ( <i>Acacia aneura</i> )	Irritant, headache, nausea, wood contains a virulent poisonous principle used for spear heads by aborigines	Eyes, lungs	4
<a href="#"><u>Muninga</u></a>	Irritant, asthma, bronchitis	Hands, lungs	2
<a href="#"><u>Myrtle</u></a>	Irritant, sensitizer	Hands, lungs	2
<a href="#"><u>Myrtle, Tasmanian</u></a>	Irritant	Eyes, lungs	2
<a href="#"><u>Narra</u></a>	Irritant, asthma	Hands, lungs	2
<a href="#"><u>New Zealand White Pine</u></a>	Irritant	Hands, lungs	.
<a href="#"><u>Norway Spruce</u></a>	Irritant, asthma	Hands, lungs	.
<a href="#"><u>Nyatoh</u></a>	Irritant	Eyes, lungs	.
<a href="#"><u>Oak (<i>Quercus spp.</i>)</u></a>	Irritant, sensitizer, asthma, NPC(rare)	Hands, eyes, lungs	2
<a href="#"><u>Obeche</u></a>	Irritant, sensitizer, runny nose, sneezing, hives, asthma	Hands, eyes, lungs	3
<a href="#"><u>Okoume</u></a>	Irritant, cough, asthma, pink eye	Hands, eyes, lungs	2
Oleander ( <i>Nerium oleander</i> )	Irritant, nearly every part of the plant is toxic, cardiac effects	Hands, heart	4
<a href="#"><u>Olive</u></a>	Irritant, sensitizer	Hands, eyes, lungs	3
<a href="#"><u>Opepe</u></a>	Irritant, sensitizer, nervous system effects	Hands, eyes, lungs	1
<a href="#"><u>Osage Orange</u></a>	Irritant, sap can cause dermatitis	Hands	.
<a href="#"><u>Osage Orange, Argentine</u></a>	Irritant, sap can cause dermatitis	Hands	.
<a href="#"><u>Padauk (<i>Pterocarpus spp.</i>)</u></a>	Irritant, sensitizer, nausea, asthma	Hands, eyes, lungs	3
Palm ( <i>Arecaceae</i> )	Irritant, constitutional effects	Hands	1
<a href="#"><u>Parinari (<i>Parinari spp.</i>)</u></a>	Irritant	Hands	.
<a href="#"><u>Partridgewood</u></a>	Irritant, hives, coughing	Hands, lungs	2
<a href="#"><u>Pau Ferro</u></a>	Irritant, sensitizer	Hands, eyes	4
<a href="#"><u>Pau Marfim</u></a>	Irritant	Hands	.
<a href="#"><u>Pau Rosa</u></a>	Irritant	Hands	2
<a href="#"><u>Pau Santo</u></a>	Irritant	Hands	2
<a href="#"><u>Peroba Rosa</u></a>	Irritant, sensitizer, nausea, asthma	Hands, eyes, lungs	3
<a href="#"><u>Persimmon</u></a>	Irritant	Hands	1
<a href="#"><u>Pheasantwood</u></a>	Cavities in the wood can contain powder that is an irritant	Hands, eyes	1
<a href="#"><u>Pine (<i>Pinus spp.</i>)</u></a>	Irritant, runny nose, asthma	Hands, lungs	2

Wood Species	Reaction	Area(s) affected	Potency (1-4)
<a href="#">Pine, Huon</a>	Irritant	Eyes, lungs	2
<a href="#">Pistachio</a>	Irritant	Hands	1
<a href="#">Poison Walnut</a>	Bark irritating to skin, dust may cause asthma, nausea, giddiness, sap is toxic and corrosive	Hands, lungs	3
<a href="#">Poplar</a>	Irritant, blisters, asthma, bronchitis	Hands, eyes, lungs	.
<a href="#">Primavera</a>	Irritant, sensitizer	Hands	2
<a href="#">Purpleheart</a>	Irritant, sensitizer, nausea	Hands, eyes	2
<a href="#">Quebracho</a>	Irritant, nausea, NPC (rare)	Lungs	2
<a href="#">Quina</a>	Irritant	Hands, lungs	2
<a href="#">Ramin</a>	Irritant, splinters go septic, asthma	Hands, eyes, lungs	2
<a href="#">Redwood</a>	Irritant, sensitizer, asthma, HP,NPC (rare)	Hands, eyes,lLungs	2
<a href="#">Rengas</a>	Sap is strongly irritating, blisters, ulcers, fever, constitutional effects	Hands	4
<a href="#">Rhodesian Teak</a>	Irritant	Lungs	2
<a href="#">Rose Butternut</a>	Irritant, pink eye	Hands, eyes	.
<a href="#">Rosewood (<i>Dalbergia spp.</i>)</a>	Irritant, sensitizer, asthma	Hands, eyes, lungs	4
<a href="#">Rosewood, Brazilian</a>	Irritant, sensitizer	Hands, eyes, lungs	4
<a href="#">Rosewood, East Indian</a>	Irritant, sensitizer	Hands	4
<a href="#">Rosewood, Siamese</a>	Irritant, rash, hives, sensitizer	Hands	4
<a href="#">Rubberwood</a>	Irritant, sensitizer (latex allergy)	Hands	2
<a href="#">Saffron-Heart</a>	Irritant, splinters go septic, lung congestion	Hands, lungs	.
<a href="#">Sassafras</a>	Sensitizer, nausea, respiratory, direct toxin, NPC (rare)	Lungs, heart	1
<a href="#">Sapele</a>	Irritant, sneezing	Hands, lungs	.
<a href="#">Satinwood, East Indian</a>	Irritant, headache, diarrhoea, sensitizer	Hands, eyes, lungs	3
<a href="#">Satinwood, West Indian</a>	Irritant, diarrhoea, rash, blisters, sensitizer	Hands	3
<a href="#">Shittim (<i>Acacia seyal</i>)</a>	Irritant, coughing	Hands, lungs	.
<a href="#">Silky Oak, Northern</a>	Irritant	Hands	2
<a href="#">Silky Oak, Southern</a>	Irritant, sap may cause blistering of skin, eyelid inflammation	Hands, eyes	3
<a href="#">Sissoo</a>	Irritant	Hands	2
<a href="#">Slash Pine</a>	Irritant, asthma	Hands, lungs	.
<a href="#">Snakewood</a>	Irritant	Hands, lungs	2
<a href="#">Sneezewood</a>	Irritant, oils within the wood cause violent sneezing	Lungs	4
<a href="#">Spruce (<i>Picea spp.</i>)</a>	Irritant, sensitizer	Hands, lungs	1
<a href="#">Sucupira</a>	Irritant	Lungs	.
<a href="#">Sugi</a>	Unspecified allergenicity		2
<a href="#">Sumac (<i>Rhus spp.</i>)</a>	Irritant, bark may cause blisters	Hands	1
<a href="#">Sweetgum</a>	Irritant	Hands	1
<a href="#">Tambootie</a>	Irritant, diarrhea, blindness, direct toxin	Hands, eyes	4
<a href="#">Tatajuba</a>	Irritant	Hands	1

Wood Species	Reaction	Area(s) affected	Potency (1-4)
<a href="#">Teak</a>	Irritant, sensitizer, rash, nausea, asthma, vision effects, pink eye,HP	Hands, eyes, lungs	3
<a href="#">Thuya</a>	Irritant	Hands, eyes	3
<a href="#">Turpentine</a>	Irritant, swelling	Eyes, lungs	.
<a href="#">Tzalam</a>	Cold-like symptoms	Lungs	1
<a href="#">Utile</a>	Irritant	Hands	.
<a href="#">Verawood</a>	Sneezing	Lungs	2
<a href="#">Walnut, African</a>	Irritant, systemic effects, NPC(rare)	Hands, eyes, lungs	3
<a href="#">Walnut, Black</a>	Irritant, sensitizer, NPC (rare)	Hands, eyes, lungs	2
<a href="#">Walnut, English</a>	Irritant, NPC (rare)	Hands, eyes, lungs	2
<a href="#">Wamara</a>	Irritant	Hands, lungs	3
<a href="#">Wenge</a>	Irritant, sensitizer, splinters go septic, nervous system effects, abdominal cramps	Hands, eyes, lungs	3
<a href="#">Western Hemlock</a>	Irritant, NPC (rare)	Lungs	.
Western Juniper ( <i>Juniperus occidentalis</i> )	Irritant	Hands, lungs	3
<a href="#">White Peroba</a>	Irritant, sensitizer, asthma	Hands, eyes, lungs	.
<a href="#">Willow (<i>Salix spp.</i>)</a>	Sensitizer, nausea, NPC (rare)	Lungs	1
<a href="#">Yew (<i>Taxus spp.</i>)</a>	Irritant, nausea, headache, cardiac effects, direct toxin	Hands, eyes, lungs, Heart	4
<a href="#">Yellowheart</a>	Irritant	Hands	2
<a href="#">Zebrawood</a>	Sensitizer	Hands, eyes	2
<a href="#">Ziricote</a>	Cross reactions possible once sensitivity to other woods have developed	Hands	2
<a href="#">Zitan</a>	Irritant, vomiting	Eyes	2

Source: Author's elaborations based on information available at [www.wood-database.com](http://www.wood-database.com)

Potency: 1 = least dangerous; 4 = Most dangerous

NPC: Nasopharyngeal Carcinoma

HP: Hypersensitivity Pneumonitis

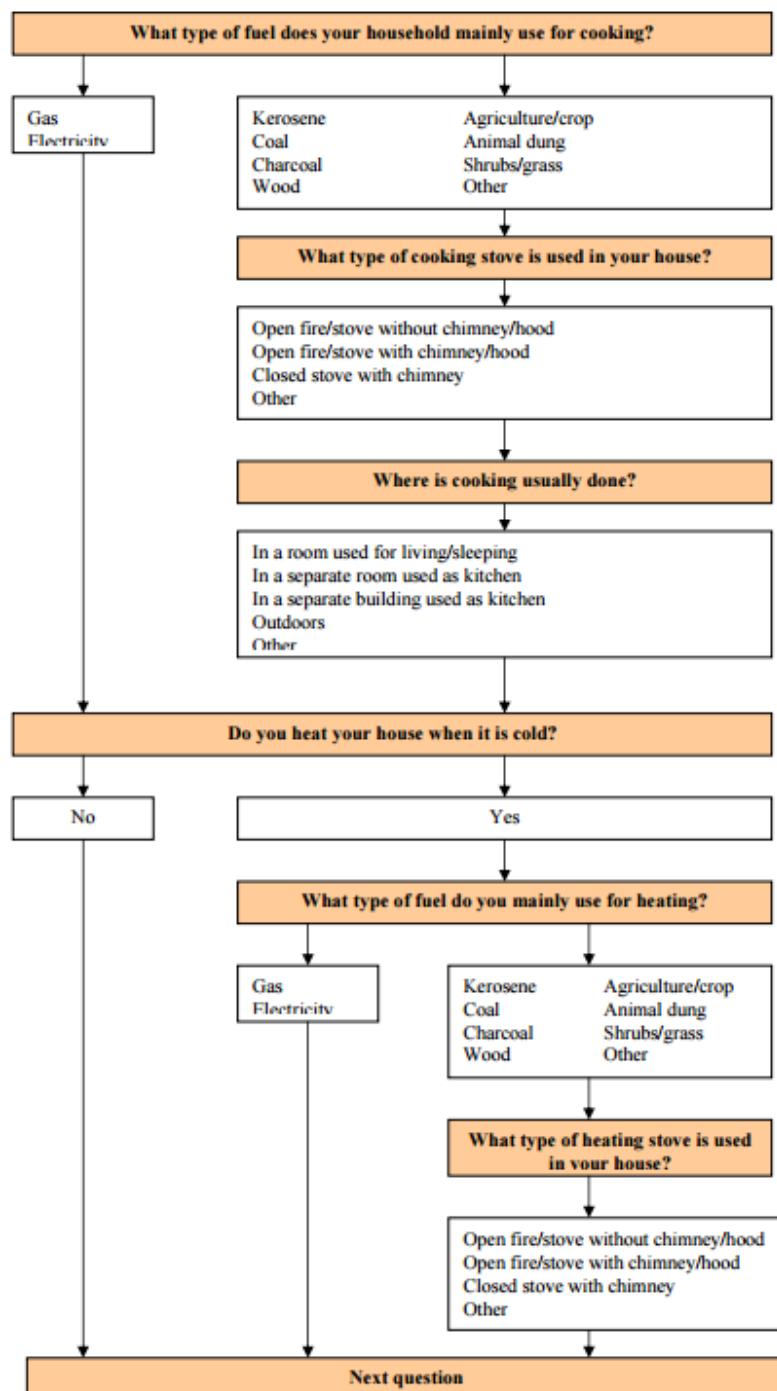
# Annex 8

## Cooking stoves listed in selected studies

Study	Country	Cooking stoves
World Bank 1991	Rwanda	Canamake, Kigali-haute, Kigali-bas(improved stoves).
FAO 1991	Bhutan	Three stone fire, Metal bar stoves (Open fire); Traditional and improved mud stove, Bumthang (Shielded fire); bukhari (space heating stove; Bhatti (Cardamom driers)
Bensel & Remedio 1993	Cebu, Philippines	LPG stove, Kerosene stove, Fuelwood stove (three stone; homemade stoves made out of biscuit tins, paint and cooking oil cans; ceramic stoves, metal stoves, cement stoves)
Jarju 2008	Gambia	Sinkiri kutoo; Kumba Gaye
Miah, Al Rashid & Shin 2009	Bangladesh	Single mouth, Double mouth and Triple mouth traditional cooking stove.
MacCarty, Still & Ogle 2010	.	Three stone fire, Ghana wood, Mud-sawdust, Baldwin VITA, Cast iron stove, Modified VITA, Skirt stove, Metal skirted rocket, Tall heavy skirted rocket, Improved tall heavy skirted rocket, Heavy skirted rocket, Improved heavy skirted rocket, Insulated brick rocket, Short light rocket, Two-pot rocket, Extra-small door with skirt, Cast iron rocket, Large baldosa rocket with skirt, Stove Tec wood stove (w/ and w/out skirt), Stove Tec charcoal stove (w/ and w/out skirt), Charcoal-making gasifier, Experimental gasifier, Large gasifier, Grid-powered fan stove, Battery-powered fan stove, Bottom air fan stove, Wood gas fan stove, Aprovecho rocket with fan, Mali charcoal stove, Charcoal jiko, Charcoal stove with skirt, Stove Tec wood or charcoal rocket, Propane (LPG) stove, Ethanol stove, Kerosene stove, L Institutional stove, Sunken two-pot insulative rocket, Sunken pots with steam jets, Insulative two-pot with holes, one-pot rocket with hole, Patsari prototype, Two-pot rocket with hole, Rectangular Justa with hole, Griddle stove with oven, "Dos por tres" rectangular justa, Large griddle stove, Large square justa
Matai, Jaagessar & Egerton 2015	Suriname	Chulha (single and dual, w/ and w/out chimney), Iron tripod, Stone tripod, coal pot, iron barrel, oven made of 2-4 stones, concrete ovens, gas stoves..

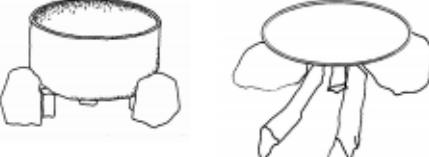
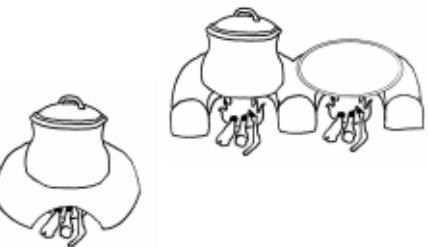
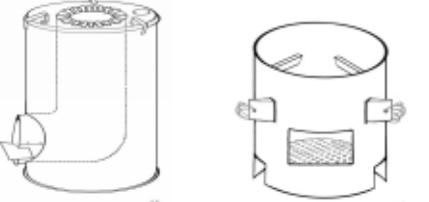
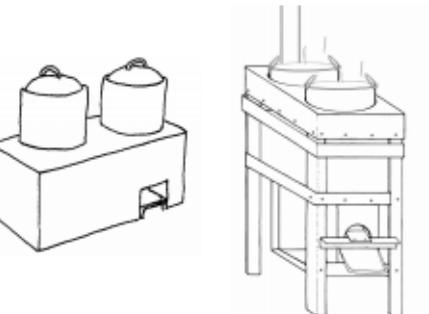
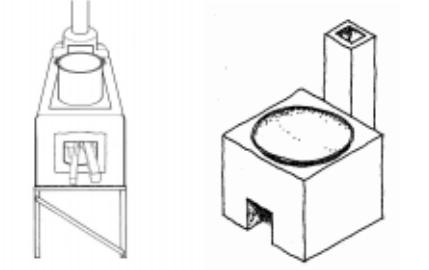
# Annex 9

## WHO Standard questions and Stove card<sup>98</sup>



<sup>98</sup> Source: [http://www.who.int/indoorair/health\\_impacts/cooking/en/](http://www.who.int/indoorair/health_impacts/cooking/en/).

**Q2: What type of stove is usually used for cooking?**

<p><b>1. Open fire</b></p> <ul style="list-style-type: none"> <li>• unprotected fire</li> <li>• pot or griddle is supported with rocks, mud or other materials</li> </ul> 	<p><b>2. Surrounded fire</b></p> <ul style="list-style-type: none"> <li>• fire is partially or completely surrounded</li> <li>• pot or griddle is supported with rocks, mud or other materials</li> </ul> 
<p><b>3. Improved single pot stove</b></p> <ul style="list-style-type: none"> <li>• fire is completely surrounded</li> <li>• open pot hole</li> <li>• pot may be sunken into the stove</li> <li>• to improve combustion, fuel is placed on grate or inside combustion chamber</li> <li>• heat goes directly to a single pot</li> </ul> 	<p><b>4. Improved multiple pot stove</b></p> <ul style="list-style-type: none"> <li>• fire is completely surrounded</li> <li>• open pot hole</li> <li>• pot may be sunken into the stove</li> <li>• to improve combustion, fuel is placed on grate or inside combustion chamber</li> <li>• heat goes directly to multiple pots</li> </ul> 
<p><b>5. Griddle stove</b></p> <ul style="list-style-type: none"> <li>• fire is completely surrounded</li> <li>• pot is placed on top of a metal or clay cooking surface</li> </ul> 	

# Annex 10

## Languages spoken in developing countries

Country name	Language(s)
Afghanistan	Pashto, Dari
Algeria	Arabic, Tamazight
Angola	Portuguese
Antigua and Barbuda	English
Argentina	Spanish, Guarani, Kom, Moqoit, Wichi
Armenia	Armenian
Aruba	Dutch, Papiamento
Azerbaijan	Azerbaijani
Bahrain	Arabic
Bangladesh	Bengali, English
Belize	English, Kriol, Spanish
Benin	French, Fon, Yoruba
Bhutan	Bhutanese (Dzongkha), English
Bolivia (Plurinational State of)	Spanish, Quechua, Aymara, Guarani
Botswana	Setswana, English
Brazil	Portuguese
Burkina Faso	French, Mòoré, Bambara, Jula,
Burundi	French, Kirundi
Cambodia	Khmer
Cameroon	French, English
Cabo Verde	Portuguese, Cape Verdean Creole
Central African Republic	French, Sango
Chad	French, Arabic
Chile	Spanish
China	Mandarin Chinese, Cantonese, Mongolian, Tibetan, Uyghur, Zhuang, among others
Colombia	Spanish, 68 ethnic languages and dialects
Comoros	Arabic, Comorian, French
Congo	French, Kituba, Lingala
Costa Rica	Spanish
Côte d'Ivoire	French, Bétè, Dioula, Baoulé, Abron, Agni, Cebaara, Senufo
Cuba	Spanish
Curaçao	Dutch, Papiamentu, English
Democratic People's Republic of Korea	Korean
Democratic Republic of the Congo	French, Kikongo, Lingala, Swahili, Tsiluba
Djibouti	French, Arabic, Somali, Afar
Dominica	English, Dominican Creole, French
Dominican Republic	Spanish
Ecuador	Spanish, Quechua, Kichwa, Shuar
Egypt	Arabic
El Salvador	Spanish
Equatorial Guinea	Spanish, French, Portuguese, Fang, Bube, Combe

<b>Country name</b>	<b>Language(s)</b>
Eritrea	Arabic, Tigrinya, English
Ethiopia	Amharic, Oromifa, Somali, Tigrigna, Afar, Wolaytta, Sidama, Kunama, Gumuz, Harari
Gabon	French, Fang, Myene, Punu, Nzebi
Gambia (Republic of The)	English, Mandinka, Fula, Wolof, Serer, Jola
Ghana	English, Adangme, Dagaare, Dagbani, Ewe, Ga, Gonja, Kasem, Nzema, Akuapem Twi, Asante Twi, Mfantse
Guatemala	Spanish, 21 Maya languages, two non-Mayan Amerindian languages
Guinea	French, Maninka, Fula, Susu
Guinea Bissau	Portuguese, Upper Guinea Creole
Guyana	English, Guyanese Creole, Akawaio, Macushi, Waiwai,
Haiti	French, Haitian Creole
Honduras	Spanish, Garifuna, Miskito
India	Hindi, English, other official languages for each state (22 languages of the 8 <sup>th</sup> schedule to the constitution)
Indonesia	Indonesian, Indonesian slang, hundreds of local languages
Iran (Islamic Republic of)	Persian, Azerbaijani, Kurdish, Mazenderani, Lurish, Arabic, Balochi
Iraq	Arabic, Kurdish, Assyrian Neo-Aramaic, Iraqi Turkmen, Armenian
Jamaica	English
Jordan	Arabic
Kazakhstan	Kazakh, Russian
Kenya	English, Swahili
Kuwait	Arabic
Kyrgyzstan	Kirghiz, Russian
Laos People's Democratic Republic	Lao
Lebanon	Arabic
Lesotho	Sotho, English
Liberia	English
Libya	Arabic
Madagascar	French, Malagasy
Malawi	Chichewa, English
Malaysia	Malaysian
Maldives	Maldivian (Dhivehi)
Mali	French, Tamazight, Bambara, Bomu, Bozo, Dogon, Fulfulde, Hasanya Arabic, Mamara, Maninkakan, Soninke, Songhai, Syenara, Tamasheq, Xaasongaxango, Arabic, Fula
Mauritania	Arabic, French, Fula, Soninke, Wolof
Mauritius	English, French, Mauritian Creole
Mexico	Spanish, Nahuatl, Yucatec Maya, Mixtec, Zapotec, etc. (68 native language groups)
Mongolia	Mongolian
Morocco	Moroccan Arabic, Berber, Hassaniya Arabic
Mozambique	Portuguese, Swahili, Makhuwa, Sena, Ndau, Tsonga, other Bantu languages

<b>Country name</b>	<b>Language(s)</b>
Myanmar	Burmese, Kachin, Kayah, Karen, Chin, Mon, Rakhine, Shan
Namibia	English, Afrikaans, German, Oshiwambo
Nepal	Nepali, Awadhi, Bhojpuri, Gurung, Kiranti, Limbu, Magar, Maithili, Nepal Bhasa, Rai, Sherpa, Tamang, Tharu
Nicaragua	Spanish, Miskito, Rama, Sumo, Garifuna
Niger	French, Hausa, Fulfulde, Gualmancema, Kanuri, Zarma, Tamazight
Nigeria	English, Hausa, Yoruba, Igbo
Oman	Arabic
Pakistan	Urdu, English, Punjabi, Balochi, Sindhi, Pashto
Panama	Spanish, Ngäbere
Papua New Guinea	English, Hiri Motu, Tok Pisin, 700 local and tribal languages
Paraguay	Spanish, Guaraní
Peru	Spanish, Quechua, Aymara, other native languages
Philippines	Filipino, English, Spanish, Cebuano, Ilocano, Karay, and more than 100 other local languages.
Qatar	Arabic
Republic of Korea	Korean
Rwanda	Kinyarwanda, English, French
São Tome and Principe	Portuguese, Forro, Angolar
Saudi Arabia	Arabic
Senegal	French, Jola-Fogny, Mandinka, Pulaar, Serer, Soninke, Wolof
Seychelles	English, French, Seychellois Creole
Sierra Leone	English, Krio, Temne, Mende
Somalia	Somali, Arabic
South Africa	Xhosa, Afrikaans, English, Sotho, Swazi, Tsonga, Tswana, Venda, Zulu
South Sudan	English, Bari, Dinka, Luo, Murle, Nuer, Zande
Sri Lanka	Sinhalese, Tamil, English
Sudan	Arabic, English
Suriname	Dutch, Sranan Tongo, Creole, Caribbean Hindustani
Swaziland	English, Swazi
Syrian Arab Republic	Arabic, Kurdish, Armenian, South Azeri
Tajikistan	Tajik, Russian
Thailand	Thai, Isan, Kelantan-Pattani Malay, numerous tribal languages
Togo	French, Ewe, Kabiyé
Trinidad and Tobago	English, Spanish
Tunisia	Tunisian Arabic, Tamazight, French
Turkmenistan	Turkmen, Russian
Uganda	English, Swahili, Luganda
United Arab Emirates	Arabic
United Republic of Tanzania	Swahili, English
Uruguay	Spanish
Uzbekistan	Uzbek, Russian
Venezuela	Spanish, more than thirty indigenous languages



<b>Country name</b>	<b>Language(s)</b>
Viet Nam	Vietnamese, French, other minorities' languages (Táy, Khmer and others)
Yemen	Arabic
Zambia	English, Nyanja, Bemba, other indigenous languages
Zimbabwe	Chewa, Chibarwe, English, Shona, Ndebele and other 10 languages

# Annex 11

## Minutes of the expert group meeting



### Statistical Methodology for Integrating a Woodfuel Module into National Surveys

Expert Consultation

Meeting minutes

4-5<sup>th</sup> April 2017  
Lebanon room, FAO Headquarters

## PARTICIPANTS FROM EXTERNAL ORGANIZATIONS

Donee Alexander (Global Alliance for Clean Cookstoves), Jeremy Broadhead (Spatial Informatics Group), Rudi Drigo (Independent Consultant), Branko Glavonjic (University of Belgrade), Gajana Hegde (United Nations Framework on Climate Change), Talip Kilic (World Bank), Jessica Lewis (World Health Organization), Tsoarello Nelson Nzemene (Lesotho Bureau of Statistics), Damián Rivadeneira (Instituto Nacional de Estadística y Censos, Ecuador), Leonardo Souza (United Nations Statistics Division), Florian Steierer (United Nations Economic Commission for Europe), Tsipiso Thabane (Lesotho Bureau of Statistics), Adrian Whiteman (International Renewable Energy Agency), Alberto Zizza (World Bank).

## PARTICIPANTS FROM FAO

Ilias Animon, Iana Arkhipova, Flavio Bolliger, Andrea Borlizzi, Arturo Gianvenuti, Arvydas Lebedys, Monica Madrid Arroyo, Giulia Muir, Mats Nordberg, Michael Rahija, Simona Sorrenti, Zuzhang Xia.

## AGENDA

Day 1, 4 April 2017 - 09:30 – 17:00	
09:30 – 10:00	Welcome Coffee
<b>Morning session - Chair: Mr Zuzhang Xia</b>	
10:00 – 10:30	Welcome by Mr Andrey Kushlin, Deputy Director, FAO Forestry Policy and Resources Division and Mr Christophe Duhamel, Coordinator, Global Strategy to improve agricultural and rural statistics (GSARS)
10:30 – 10:45	Tour de table: invited experts self-introduce themselves
10:45 – 11:00	Introduction to the Global Strategy (Mr Flavio Bolliger)
11:00 – 11:15	Introduction to FAO Forest Products Statistics (Mr Arvydas Lebedys)
11:15 – 11:45	Background: Overview of the project, links with the SDGs and the Minimum Set of Core Data (MSCD) of the Global Strategy (Ms Monica Madrid)
11:45 – 12:15	Discussion and comments
12:15 – 13:30	Lunch
<b>Afternoon session - Chair: Mr Adrian Whiteman</b>	
13:30 – 14:00	Woodfuel: Literature review, international recommendations and review of existing surveys (Mr Jeremy Broadhead)
14:00 – 14:30	Discussion and comments
14:30 – 15:00	The proposed Woodfuel Survey Module (WSM): short and long form (Mr Andrea Borlizzi)
15:00 – 15:30	Discussion and comments
15:30 – 16:00	Coffee Break
16:00 – 16:30	Measurement issues, recall period, and local adaptations of the WSM (Mr Andrea Borlizzi)
16:30 – 17:00	Discussion and comments

Day 2. 5 April 2017 - 09:00 – 17:00	
<b>Morning session - Chair: Mr Arvydas Lebedys</b>	
09:00 – 09:30	Data analysis and woodfuel indicators (Mr Andrea Borlizzi)
09:30 – 10:00	The WHO survey harmonization work for SDG 7 (Ms. Jessica Lewis)
10:00 – 10:30	Discussion and comments
10:30 – 11:00	Coffee Break
11:00 – 11:30	Field test of the WSM: preliminary proposal (Mr Andrea Borlizzi)
11:30 – 12:00	Discussion and comments
12:00 – 13:30	Lunch
<b>Afternoon session - Chair: Mr Mats Nordberg</b>	
13:30 – 14:00	The Lesotho Household Energy Consumption Survey (Ms. T. Thabane)
14:00 – 14:30	The Ecuador Encuesta Condiciones de Vida (ECV) (Mr. D. Rivadeneira)
14:30 – 15:00	Discussion and comments
15:00 – 15:30	Coffee Break
15:30 – 16:00	The woodfuel project: Steps forward (Ms M. Madrid)
16:00 – 16:30	Discussion and comments
16:30 – 17:00	Wrap-up and concluding remarks (Chair)

## DAY 1

The meeting opened with welcome remarks given by FAO Forestry Policy and Resources Division Deputy Director, Andrey Kushlin, and by Global Office Coordinator, Christophe Duhamel.

Mr. Duhamel remarked that the Global Strategy to Improve Agricultural and Rural Statistics (GSARS) - endorsed by the United Nations Statistical Commission at its forty-first session in February 2010 – had come as a response to address developing countries' lack of capacity to provide reliable statistical data on food and agriculture and to provide a blueprint for long-term sustainable agricultural statistical systems. GSARS is based on three pillars: (a) the establishment of a minimum set of core data; (b) the integration of agriculture into National Statistical Systems (NSS) in order to meet policymaker and other data user expectations about the possibility of linking statistical information across the economic, social and environmental domains; and (c) the sustainability of agricultural statistical systems through governance and statistical capacity-building.

The interest of GSARS in having a woodfuel statistical methodology guidelines development was based on the assessment of the data that users need. According to this assessment, in addition to a serious decline in the quantity and quality of agricultural statistics occurred in the past years, many new data requirements had emerged. As a result, a conceptual framework that related the economic, social, and environmental dimensions of agriculture had been formulated. It incorporates forestry, fisheries, land and water use in addition to the narrower, more conventional treatment of agricultural production. The use of biomass fuels, in particular, was identified as an important activity that could help to

understand the effects of agricultural sector on the environment and climate change.

Mr. Duhamel mentioned that the Global Strategy was implemented through its Global Action Plan, which defines the technical assistance, training and research plans as well as the governance mechanism. At global level, the programme is coordinated by the Global Office, hosted by the FAO Statistics Division. The Global Office oversees more than 25 different lines of research (grouped into 17 themes) to produce cost-effective methodologies that help countries to improve their agricultural statistical systems. Forestry is one of the themes in which the Global Office has decided to work in close collaboration with the Forestry Department of FAO.

After the opening remarks, the invited experts introduced themselves by indicating their affiliation and area of expertise.

### **Presentation by Mr. Flavio Bolliger, Research Coordinator of the Global Strategy**

Mr. Bolliger described the outline of the Global Strategy Action Plan and Research Program. Notable points of the presentation regarded the practical approach of the Global Strategy applied research projects, which are intended to producing cost-effective methodologies to help developing countries improve their agricultural statistical systems. He then highlighted the outputs of the Global Strategy research activities from 2014 until now - constituted by 12 handbooks and guidelines, 20 technical reports and 16 working papers – and discussed the ongoing research activities.

The research portfolio of the Global Strategy requires a variety of tools and approaches. Generally, the Global Office followed some steps prior to the expert group meeting such as conducting a literature review of the topic under study and developing a gap analysis of the scientific literature and a preliminary proposal of statistical methods. As already mentioned, the expert group meeting was held to review the outcomes of former steps and provide feedback on the methods proposed.

### **Presentation by Mr. Arvydas Lebedys, Forestry Officer, FAO Forestry**

Mr. Lebedys presented the core activities of the FAO Statistical Programme for Forest Products and the type of global data jointly collected every year by FAO, Eurostat, the International Tropical Timber Organization (ITTO) and the United Nations Economic Commission for Europe (UNECE). He then illustrated the

major data products, among which: (a) the interactive FAOSTAT-Forestry database; and (b) the work done by the team on statistical standards and classifications and capacity development in countries. He finally described how the woodfuel project fitted into the core activities of the team.

### **Presentation by Ms. Monica Madrid Arroyo, Focal Point of the Global Strategy**

Ms. Madrid Arroyo gave a brief presentation during which she described the two projects jointly undertaken by the Global Strategy and FAO-Forestry, the outline of the woodfuel project, and its links with the Sustainable Development Goals, the FAO Strategic Programmes and the Minimum Set of Core Data of the Global Strategy. She highlighted the importance of woodfuel consumption and production worldwide, and also the widespread negative perception associated with its use. She especially focused on the lack of reliable data on woodfuel consumption in developing countries, and explained how the project would contribute towards filling this gap.

### **MAIN POINTS OF DISCUSSION**

- Ms Lewis of the WHO highlighted that her organization is the custodian agency for two of the Sustainable Development Goals indicators mentioned in the last presentation (3.9.1 and 7.1.2), and that it is particularly important to harmonize the questions of the proposed WSM with those proposed by WHO. There is hence room for further coordination of the activities. She suggested to supplement the list of Sustainable Development Goals presented with the indicator 7.3.1 – Energy intensity measured in terms of primary energy and GDP. Mr. Souza from UNSD added that the list could be supplemented also with the indicator 7.2.1 – Renewable energy share in the total final energy consumption, of which UNSD is one of the custodian agencies, as woodfuel makes up a big chunk of what comprise renewable energy in many developing countries.
- Mr Broadhead of the Spatial Informatics Group pointed out that many modules have already been produced by different organizations: he wondered whether they have been taken up. Mr Kilic of the World Bank replied that his organization has developed, in collaboration with the FAO Forestry Department, a sourcebook that includes a woodfuel module, and that there is also the ESMAP group of the World Bank that developed a questionnaire for the energy survey, with questions on woodfuel consumption. The latter questionnaire will be adopted by seventy-eight countries over the next 15 years, with a three-year time

span between consecutive surveys, for a total of 390 surveys. Clearly some adaptations will be needed to fit country specificities. Mr Bolliger (Global Strategy) added that multipurpose household surveys might be the best way for surveying woodfuel consumption data, especially in countries with limited amount of resources available for surveys, and that specific sub-sampling strategies should be developed.

- Mr. Hegde of the United Nations Framework Convention on Climate Change (UNFCCC) highlighted the importance of computer-assisted personal interviewing data collection methods in order to gather better information. Another option could be crowd-sourcing of data from non-government sources.

### **Presentation by Mr. Jeremy Broadhead, Spatial Informatics Group**

The presentation given by Mr. Broadhead focused on the assessment of the availability and quality of existing woodfuel statistics. He highlighted the main causes of the insufficient level of attention paid to woodfuel statistics by countries with low reporting rates; he also listed the main sources of information about woodfuel consumption and production, including FAOSTAT, IEA, UNSD and ESMAP, as well as the main types of surveys collecting information on woodfuel. The resulting amount of data is considerable, but it is not systematically assessed, despite of the strong demand of data from many organizations and areas. His main recommendations for the improvement of woodfuel statistics were: (a) to develop a woodfuel module to be incorporated in national surveys and censuses – with a view to survey woodfuel consumption in the residential, commercial, industrial and public sector; and (b) to revise the FAO procedures for estimating woodfuel consumption, which had not been updated in the past 20 years.

### **MAIN POINTS OF DISCUSSION**

- A brief discussion about the differences between FAO and IEA estimates and projections of woodfuel consumption followed the presentation. Mr. Whiteman of the IRENA specified that it was an issue of different models used to make estimates. In general, IEA figures were twice as the ones of FAO.
- Mr. Drigo (Independent, former FAO staff member) remarked that, as more than 80 percent of all woody biomass used in developing countries is for energy, assessing the sustainability of woodfuel production is of paramount importance for its implications in sustainable forest management and climate change. For this reason, obtaining reliable and detailed consumption statistics is also critical. He mentioned that

woodfuel sustainability is still highly controversial because of the poor data and estimation methods, which heavily affects forestry planning at national and international scales.

- Mr Souza of the United Nations Statistics Division (UNSD) pointed out that Brazil also surveyed industrial consumption of woodfuel and other solid biofuels, such as bagasse and black liquor. As these fuels are not included in FAO database, he would like to rely on FAO to fill related data gaps in UNSD's Energy Statistics Database. He also pointed out that the use of woodfuel by the industrial sector should be included in the literature review.
- Mr Steierer from UNECE suggested that revising the model to estimate woodfuel consumption could be a valid step towards improving the global statistics.

### **First presentation by Mr. Andrea Borlizzi, Consultant, FAO Forestry**

In the presentation, Mr. Borlizzi reviewed the main types of surveys and censuses that already included questions on woodfuel. He also introduced the two versions (short and long) of the proposed Woodfuel Supplementary Module to be incorporated into household surveys questionnaires. For each type of household survey, an analysis of the different questions included in the questionnaire of selected countries was performed, and recommendations were provided about which surveys are suitable for incorporating the module. Then, a detailed description of the sections and questions of the proposed WSM was provided.

### **MAIN POINTS OF DISCUSSION**

- Ms. Alexander from the Global Alliance for Clean Cookstoves highlighted the need to further disaggregate the “fuelwood” category, which includes, among other things, cleaner fuels, such as briquettes and pellets.
- Ms. Lewis (WHO) said that in section 3 – Household fuel combustion – it is important to capture not just the “main” cookstove and heating system, but also the secondary technologies and fuels adopted by households. In fact, the impact on health is determined by the fuel-technology combinations adopted by households for cooking, heating and lighting.
- Mr. Drigo (Independent, former FAO staff member) pointed out that it is difficult to capture the quantities used for every single use, also because there might be some overlap among different uses (for example: cooking and heating). He suggested that the focus should primarily be

- on the quantitative estimation of household consumption and to leave the breakdown by single use as a secondary parameter (as percent of total).
- Mr. Animon of FAO suggested that a more detailed classification of forests and other areas where wood is collected be used.
  - Mr. Whiteman of IRENA suggested that the order of the questions should be changed, with the questions on household fuel combustion asked first, followed by questions on consumption and production.
  - Mr. Nzemene of Lesotho Bureau of Statistics suggested that questions about the commercial uses of woodfuel should not be included, as – at least in Lesotho – households and commercial activities are located in separate places.

### **Second presentation by Mr. Andrea Borlizzi, Consultant, FAO Forestry**

In the second presentation, Mr. Borlizzi described the main points of the proposed methodology: measurement of variables, choice of the recall period, data collection modes, different modalities to include the WSM into existing questionnaires, sampling strategies and local adaptations of the WSM.

The main methodological issue – measurement of weight – had been initially discussed through a review of methodologies adopted in previous studies. The proposed methodology was to weigh woodfuel – both bundles of fuelwood and sacks of charcoal - through the use of a spring scale, expressing additional quantities as number of bundles or sacks similar to the ones just weighed. The proposed recall period was the previous month. Local adaptations of the module mainly included translation into local languages and adaptation of the list of main stoves and kilns used by the country. The module has been designed for both paper-and-pencil interviewing and computer-assisted personal interviewing. The advantages of the second option were explained, although the adoption of the data collection mode depends mainly on the country. The sampling strategy proposed entails selecting a sub-sample of households that will receive the WSM from the sample of households that will receive the survey questionnaire. Since most surveys adopt a 2-stage stratified cluster sampling, the sub-sample will include a fixed proportion of households sampled in each selected cluster. The sample size should enable estimates to be derived at the national level and the rural/urban level. Other aspects considered were the selection of the appropriate respondent, the training of enumerators and the choice of the right timing for the interview. Finally, it was discussed how to incorporate the WSM into the questionnaires of the main types of surveys (Multiple Indicator Cluster Surveys, Living Standard Measurement Study, Comprehensive Food Security and Vulnerability Analysis (SCFVA) and other national household surveys).

## MAIN POINTS OF DISCUSSION

- Mr. Glavonjic (University of Belgrade) proposed that the timing of fuelwood collection – in terms of number of weeks before the beginning of the cold season – should also be investigated, in order to estimate the efficiency of fuelwood consumption. Other parameters needed for this estimation are the wood moisture and the surface area being heated (in m<sup>2</sup>).
- Mr. Souza (UNSD) suggested that the two questions on wood species and wood humidity should be included in the short form of the WSM, as they were included only in the long form. This would make it possible to estimate the energy content of wood and the household share of energy derived from woodfuel also with the short form, allowing for the formulation of targeted policies to improve the efficiency of fuelwood use.
- Mr. Drigo suggested that the “fuelwood” category should be disaggregated into “conventional” fuelwood (solid wood from split stems and branches) and “marginal” fuelwood (made by twigs and brushwood from recurrent pruning of farm trees and shrubs), as confusion between those two categories might result in an overestimation of the impact of fuelwood collection on forest resources (mainly limited to conventional fuelwood) and biased analyses of sustainability. He mentioned that a similar distinction (fuelwood vs brushwood) was already applied by the International Energy Agency. He also suggested that the questions concerning households’ production of fuelwood and charcoal production for sale be omitted because the information would not produce complete woodfuel production data and could unnecessarily complicate the questionnaire. Moreover, different persons should be interviewed concerning consumption and production.
- Mr. Zezza (World Bank) suggested that non-standard units be used to avoid the need to weigh wood. A library of standard units with their conversion factors was being developed by the World Bank, along with visual supports. He also pointed out that people collect wood once for all possible uses, so it might be better to have just one weight and then to break down the total quantity by different types of uses.
- Ms. Alexander (Global Alliance for Clean Cookstoves) pointed out that people might have problems estimating the amounts of woodfuel consumed for each type of use.
- Ms. Lewis (WHO) suggested that a second-best approach be considered for estimating woodfuel quantities in case there was no wood to weigh at home, or it was located in another place. Mr. Borlizzi replied that a good solution could be the one proposed by Mr. Zezza, namely the use

of local non-standard units of measurement and of the respective conversion factors. Ms. Lewis also highlighted the importance of measuring the time spent for purchasing woodfuel, and suggested it could be worthwhile to compare time spent collecting fuelwood with time spent going to collect LPG canisters or purchasing charcoal from a market.

## DAY 2

### **First presentation by Mr. Andrea Borlizzi, Consultant, FAO Forestry**

Mr. Borlizzi briefly described the set of indicators – on woodfuel consumption and production, and on household fuel combustion - that could be derived from the data collected through the proposed WSM (short and long forms). He highlighted the links to the Sustainable Development Goals indicators and described the additional analyses that could be performed by matching woodfuel data with other socio-economic data collected in other sections of the main survey questionnaire. A brief discussion regarding the type of indicators that, instead, could not be built from the WSM data ensued.

### **Presentation by Ms. Jessica Lewis, Consultant, World Health Organization**

Ms. Lewis presented the work carried out by the WHO in recent years on the “Harmonization of Household Energy Use Surveys”. She first introduced the main concepts of Household Air Pollution and its impact on health. She then described the WHO Household Energy Database, which includes nationally-representative surveys with questions on cooking, heating and lighting, and the Sustainable Development Goal indicators of which WHO is the custodian: indicators 7.1.2, 11.6.2 and 3.9.1. Then she outlined the multi-stakeholder process of survey harmonization, the challenges faced and the main goals to be achieved. The seven essential questions for monitoring indicator 7.1.2 were then illustrated, followed by a review of pilot tests that had already been undertaken in nine countries of the Africa and Latin America and the Caribbean regions. The last part of the presentation was about the questions on household energy that had already been included in the sixth round of the Multiple Indicator Cluster Survey and the “new” household energy use questions.

## **MAIN POINTS OF DISCUSSION**

- With regard to the first presentation on indicators, Ms. Lewis (WHO) suggested that data on crop residues be collected in addition to data on woodfuel. Ms. Alexander (Global Alliance for Clean Cookstoves), moreover, suggested that data on the use of wood pellets – which, as

opposed to “traditional” fuelwood, are considered a clean fuel by WHO if used in a device that meets the targets for emissions laid out in the WHO Guidelines for indoor air quality – should also be collected.

- A brief discussion followed, about the definition of “clean” fuels adopted by WHO, and whether or not traditional fuelwood should be considered clean.
- Mr. Animon (FAO) asked whether the questions used in the WSM would allow also for building indicators of the sustainability of wood production. Mr. Borlizzi replied that sustainability could only be partially estimated, as the number of questions needed for a thorough evaluation would increase the size of the module.

### **Second presentation by Mr. Andrea Borlizzi, Consultant, FAO Forestry**

In his final presentation Mr. Borlizzi briefly introduced a preliminary proposal for the field tests to be undertaken in Lesotho and Ecuador. After a short introduction of the two main categories of methods for testing – pre-field and field methods – he explained that the purpose of the test would be to collect qualitative and quantitative data. The test would be performed in two phases: the first, preparatory, phase, would include interviews with key informants, translation of the questionnaire, planning of field activities and training of enumerators. During the second phase, the main issues to be tested would be the suitability of the equipment and the proposed weighing methodology; the correctness of the chosen recall period; the flow and content of the module; and the time needed to complete the interviews with both the short and the long form.

### **MAIN POINTS OF DISCUSSION**

- Ms. Lewis (WHO) suggested that it could be useful to survey the gender of children collecting wood, in order to have disaggregated statistics on the involvement of boys and girls. She also expressed her interest in working together to include some of the WHO survey questions into the proposed module.
- Mr. Whiteman (IRENA) suggested to use the WHO set of questions about household fuel combustion and to put them at the beginning of the module. Questions on the quantities of fuel used should follow, but they should not include quantities of other types of biomass, such as crop residues, as they may be more difficult to measure. The use of other types of biomass could be qualitatively – not quantitatively – surveyed.

### **Projection of the United Nations Economic Commission for Europe video “More heat with less wood”**

Mr. Steierer of UNECE showed to the audience the video “More heat with less wood”, which was prepared by UNECE and available at: <https://www.youtube.com/watch?v=9z-EGVeKTrc>.

### **Presentation by Ms. Tsepiso Thabane, Chief Statistician, Environment and Energy Statistics, Lesotho Bureau of Statistics**

Ms. Thabane introduced the Household Energy Consumption Survey to be jointly implemented in Lesotho in July 2017 by the Department of Energy and the Bureau of Statistics (BOS). The survey would be used to update the national data on energy obtained with a similar survey conducted in the 1980's. Funds for the implementation of the survey were to be provided by the Department of Energy, the Bureau of Statistics and the United Nations Development Programme. She then illustrated the main steps already taken – development of questionnaire and training material, pre-test of the questionnaire, training of supervisors, and pretest – and the main sections and questions of the questionnaire, with a specific focus on the biomass, cooking, heating and lighting modules. Ms. Thabane also provided a brief description of the pilot: coverage, organization and methodology used to measure wood and collect data. She then discussed the challenges faced during the data collection phase and the activities planned for the next months.

### **Presentation by Mr. Damián Rivadeneira, Household Survey Expert, Instituto Nacional de Estadísticas y Censo, Ecuador**

Mr. Rivadeneira talked about the Integrated Household Survey System (IHSS) currently in place in Ecuador, its structure and its axis surveys, which included the Labour Force Survey, Living Conditions Survey, Income and Expenditure Survey and Child Labour Survey, among others. He then described the main characteristics of the 2010 Population and Housing Census and of other main surveys, as well as the questions on woodfuel already included in them and the results obtained. He then described the main characteristics of cognitive test methods used to evaluate questionnaires and a proposal for a sample design for the field test of the woodfuel module.

## **MAIN POINTS OF DISCUSSION**

- Mr. Nzemene (Lesotho Bureau of Statistics) pointed out that in Lesotho fuelwood can be collected up to three times a day, i.e. once for each main meal. This should be taken into account when wood is weighed. He also highlighted that measuring wood humidity would increase the costs of the survey because of the additional time needed.

- Mr. Animon (FAO) asked Ms. Thabane how the Lesotho Bureau of Statistics dealt with people's reluctance to be interviewed. She replied it was useful to make people aware of the importance of the survey through the media, mainly radio and TV.
- Mr. Souza (UNSD) suggested that the answer options of the question on fuel used for cooking in Ecuador be changed, in order to have separate categories for fuelwood and charcoal.
- Ms. Lewis (WHO) pointed out that, based on the experience of WHO in the field tests, it was necessary to calibrate every day the spring scale with a reference weight in order to get reliable measurements.

### **Presentation by Ms. Monica Madrid Arroyo, Focal Point of the Global Strategy**

Ms. Madrid Arroyo (Global Strategy) gave a brief presentation on the main activities performed and the associated outputs, and the next steps of the project. The latter mainly consist of: (a) the finalization of Technical Report 3 with the statistical methodology; (b) the writing of the field test protocol; (c) the implementation of field tests in two pilot countries (Ecuador and Lesotho) and (d) the writing of the final guidelines, which would include the outcomes of both the expert consultation and the field tests.

### **GENERAL DISCUSSION ABOUT ALL THE PRESENTATIONS OF THE MEETING**

- Ms. Alexander (Global Alliance for Clean Cookstoves) inquired about the ultimate objective of the current meeting and whether FAO was expecting the proposed module would be incorporated in the several surveys undertaken by different agencies. Mr. Borlizzi replied that everything started from the recognition of a data gap and of the need for developing a new methodology. Each organization, however, was responsible for their own surveys and indicators, and the adoption of the proposed methodology was to be evaluated by each agency.
- Ms Lewis (WHO) highlighted the wide range of opportunities for collaboration in the near future, including adding the essential set of survey questions needed to assess use of clean fuels and technologies (SDG 7.1.2) developed and tested by WHO and other partners to the FAO module. In addition, she suggested addition of a few core questions from the proposed FAO module to the more comprehensive set of survey questions developed by WHO and other partners (which capture data beyond the essential information needed for SDG 7.1.2).

**Wrap-up and concluding remarks by Mr. Mats Nordberg, Team Leader,  
Food and Agriculture Organization of the United Nations**

Mr. Nordberg closed the expert meeting by highlighting the importance of quantifying the amount of wood removed from forests, especially in the light of the Paris Agreement. He also highlighted the positive outcomes the current meeting would bring about, especially in terms of cooperation among different United Nations agencies working on similar topics.

He thanked all the invited participants for their active participation, as well as the people who contributed to the organization of the event, and declared the event concluded.