MECS
Modern Energy Cooking Services

Electric Cooking Outreach (ECO) webinar series: research methods and tools

Webinar 2: Setting up a Cooking Diaries study

Loughborough University

ESMAP
Energy Sector Management Assistance Program

UKaid
from the British people

This webinar covers

- Recording data
  - Energy meters & dataloggers
  - Paper forms & KoboToolbox
  - Categorising dishes and electric appliance selection
  - Registration surveys
- Getting the right people
  - Selection of participants
    - Wiring and electricity supply issues
  - Recruitment of enumerators
- Enumerator and participant training

Types of energy meter and what they're used for

	Plug-in energy meter	Datalogger
What is each used for? (resolution)	Records the amount of electrical energy used to prepare **each dish OR each meal**.	Continuously records electricity consumption readings to create a '**load profile**' for cooking energy demand, which enables understanding of how power demand changes at the **sub-dish** level*.
Data verification	**Participants may forget** to record or record an incorrect value (e.g. 5kWh instead of 0.5kWh), but participants and enumerators can **verify data as they record/check diary entries**	**Prone to errors in recording** if data not verified until the end of the study, but **some models can transmit** data directly to a server for continuous verification
Data analysis	**Creates a single dataset** - energy readings recorded by participants alongside diary data	**Creates a separate dataset** that has to be matched with the cooking diary

*This higher resolution **load profile data** enables understanding of how power demand changes with different appliances/cooking processes at the **sub-dish** level, e.g. cooking with a rice cooker typically uses high power constantly, whilst cooking with an EPC typically only draws high power continuously at the beginning of each cooking cycle, when frying or pressurising.

FAQ.

- Can I just use plug-in energy meters?
- Will the datalogger be affected by 'noise' from other non-cooking electrical appliances –e.g. lights, TV?

Choosing a plug-in energy meter

The plug-in energy meter must:

- Have a live display of kWh consumed
  - With an accuracy of at least 0.01kWh
- Be able to support the rated power of the appliance/s on trial for at least 1 hour continuously without overheating.
  - Recommended 3kW minimum rating.

Ideally, it should:

- Have a display that is easy to read
- Be easy to reset to zero

Check local availability as they may have to be imported

- Check online retailers (e.g. Amazon), or electrical hardware suppliers

Further recommendations for plug-in meters (e.g. display, functions, build) on p.44 of the Cooking Diaries Protocol V3.0

Choosing a datalogger

The datalogger must:

- measure time-series power (or energy) data with resolutions of **at least 50W and 1 minute**.
- **not require** a **WiFi** connection.
- **not lose data** when **unplugged** or during a **blackout**.

The datalogger should:

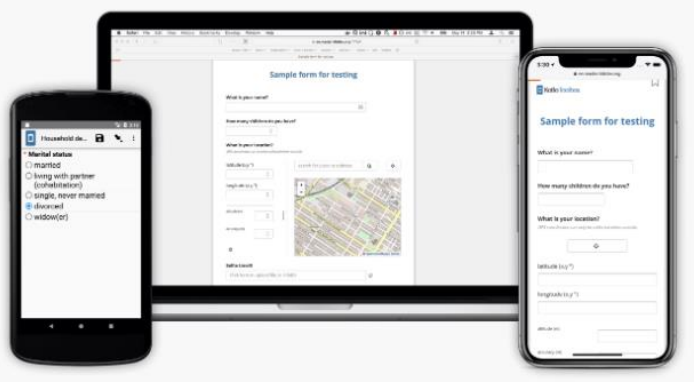
- **Store several months of data** on the device.
- Enable enumerators to **easily download data** via by Bluetooth, SD card or USB
- Come with software that makes **verifying the data in the field** straight forward.

Check local availability as they will likely have to be imported

- Contact **local research institutions** with experience on energy monitoring projects (e.g. KAPEG, EED Advisory/Kaiote)
- Contact **international datalogger specialists** (e.g. Geocene, A2EI, Sparkmeter, Nexleaf)

Further recommendations for dataloggers (e.g. display, functions, build) on p.45 of the Cooking Diaries Protocol V3.0 a list of datalogger specialists will be uploaded to the ECO shared folder and the MECS team are happy to make introductions.

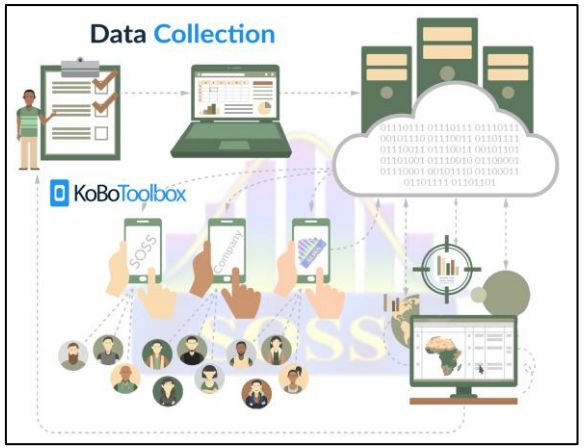
KoboToolbox



What it is and how it works

Free, open source digital data collection platform designed for use in humanitarian & development settings.

Enumerators go to field with questionnaire loaded on **Android** smartphone / tablet → Enumerators enter data on smartphone / tablet → When internet connection available, data sent to Kobo server → All responses to questionnaire available for download from Kobo server



Key benefits

- **Cuts out** time consuming & error-prone **data entry** stage
- Doesn't require an internet connection when collecting data
- Data can be verified/corrected on the go
- Example KoboToolbox questionnaires available from the **ECO shared folder**

FAQ: Can I use KoboToolbox on an Apple phone/tablet?

Categorising the menu

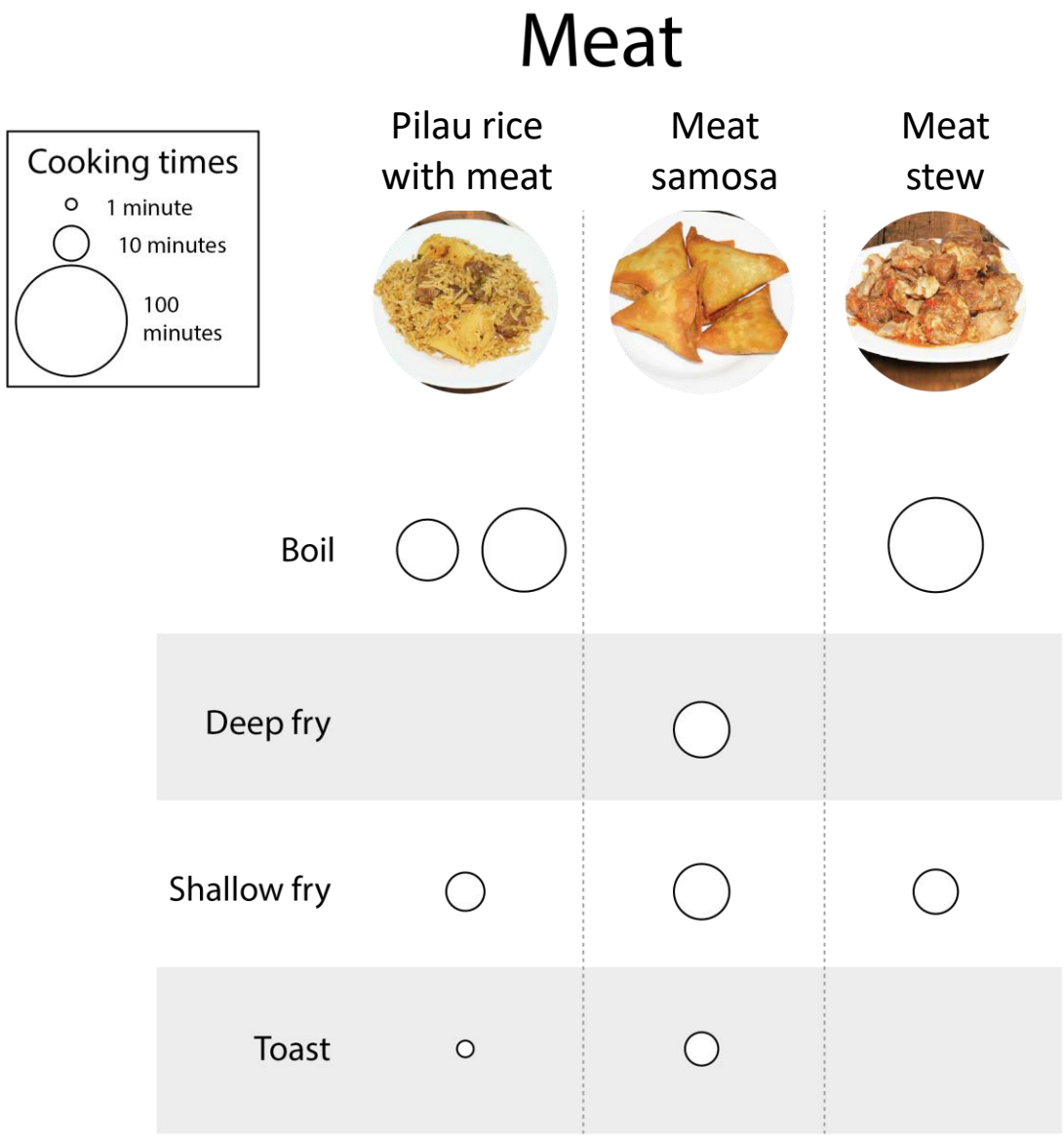
Why?

- To select appliances for the cooking diary study that are suitable for local cooking practices
- To ensure the data collected can **show this compatibility as clearly as possible**

How?

- Identify the **most popular local dishes**:
  - typically 10-20 dishes
  - emphasise frequency of cooking (e.g. everday) at home and differences in preparation techniques over other factors
- **Record** the **recipes**
- **Categorise dishes**, focussing on:
  - cooking processes, e.g. boiling, frying.
  - cooking time (for each process)
  - any unusual practices, e.g. vigorous stirring, specific pan shapes
  - typically 4-8 categories

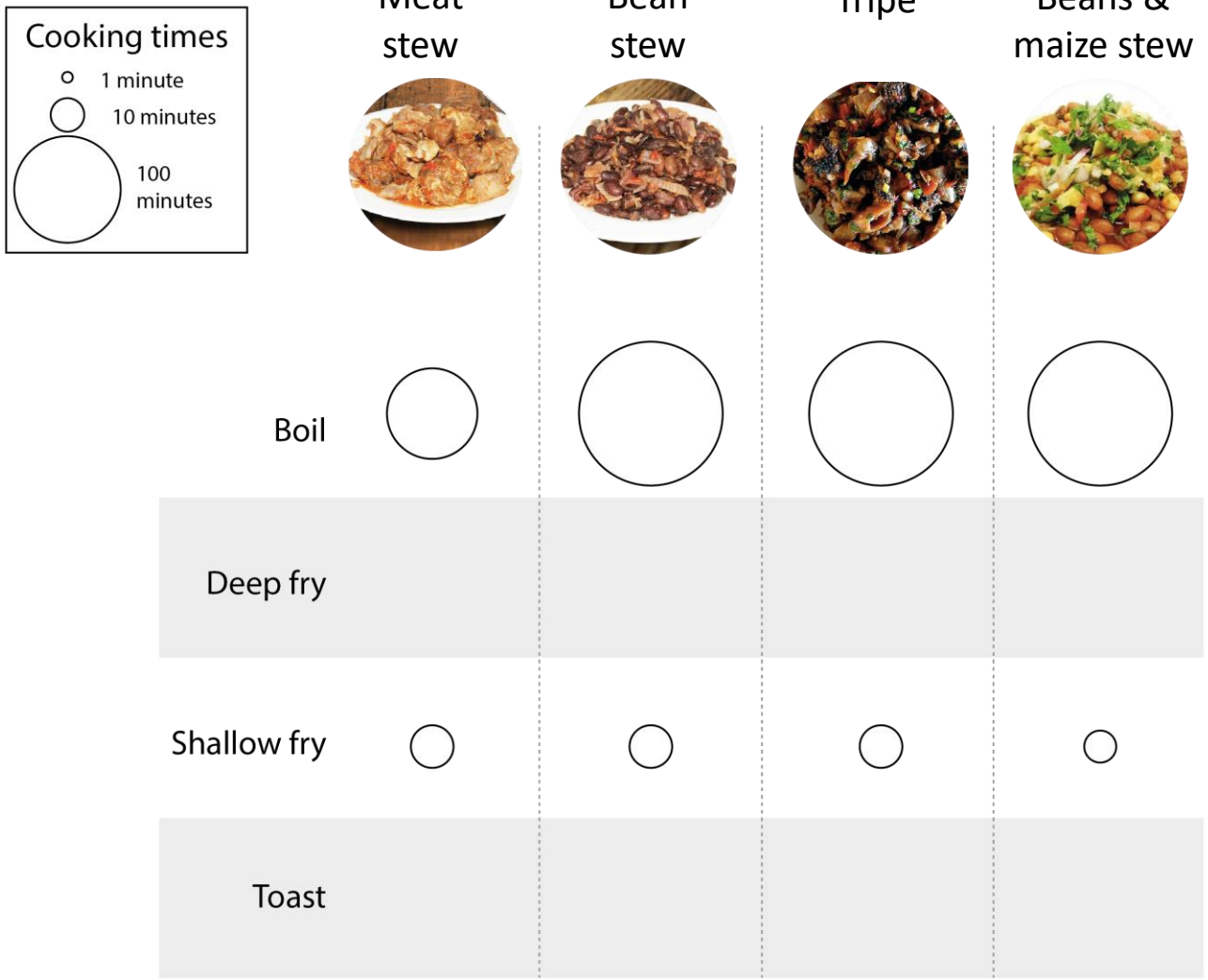
Categorisation: don’t categorise by main ingredient



- Often little correlation between cooking processes if grouping solely by main ingredient
- An appliance that cooks meat stew well may not cook samosas well

Categorisation: do categorise by main process and time

Heavy foods



- Grouping by cooking process and time produces categories of food that are easy to match with types of appliance
- Also consider any any unusual practices, e.g. vigorous stirring, specific pan shapes

Optional: additional processes for matching electric appliances with food categories

Option 1: Hold a participatory cooking session

- test a range of appliances with one dish from each of the identified food categories
- measure energy consumption and participants' experience of both usability and taste

Option 2: Create a score card for each appliance

- Rate how well it performs each cooking process

Useful resources available from MECS.org.uk & ECO Shared Folder:

- Annex 4 of the Cooking Diaries Protocol V3.0 (p.47) for an example of categorising dishes
- Kitchen Laboratory Controlled Cooking Test (CCT) Field Guide V1.0
- 'Electric Pressure Cooker Selection Guide'

Participatory cooking session in Zambia

Appliance scorecard

	EPC	Hotplate
		
Boil	5	3
Deep fry	0	3
Shallow fry	3	3
Toast	3	3

- Score the ability to perform each cooking process
- Can encompass:
  - Energy-efficiency
  - Cooking time
  - User experience

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Heavy foods

Cooking times

- 1 minute
- 10 minutes
- 100 minutes

	Meat stew	Bean stew	Tripe	Beans & maize stew
				
Boil	10 minutes	100 minutes	100 minutes	100 minutes
Deep fry				
Shallow fry	10 minutes	10 minutes	10 minutes	10 minutes
Toast				

Appliance scorecard

	EPC	Hotplate
		
Boil	5	3
Deep fry	0	3
Shallow fry	3	3
Toast	3	3

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Registration survey

Purpose: to understand what types of households are participating in the study

Process: Each enumerator collects basic household information, such as:

- Contact details
- Simple demographic data
  - e.g. age, gender, level of education, no. people in the household, type/location of household
- Cooking devices and utensils owned
- Current fuel expenditures

Example KoboToolbox registration survey available on the ECO shared folder

Example paper registration survey available on the ECO shared folder and p.140 of the 'eCook Kenya Cooking Diaries Working Paper'

Recruitment of enumerators

Critical! The selection of enumerators has a huge bearing on how easy/difficult the study is to conduct and the quality of the data collected.

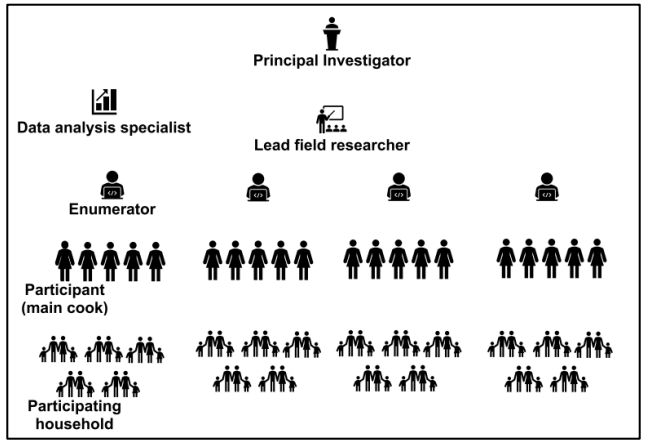
Role of enumerators

- Visit households daily during intensive cooking diary phases to interview participants about what they have cooked and how.
  - input this data on KoboToolbox – a digital data collection platform.
  - input time/energy data recorded by participants from plug in energy meters
  - download data from dataloggers and cross-check with diary
- Be the 'eyes and ears' of the study on the ground.
- Ensure the participants have a positive experience during the study.

Requirements of enumerators

- Personable, polite, encouraging and supportive
- Educated, literate, numerate
- Speak the local language(s)
- Familiar with local foods and cooking techniques

FAQ: Why 5 households per enumerator? Can an enumerator visit more?



Roles in a typical cooking diaries study

Enumerator providing plug-in energy meter training

Example enumerator training process

Day 1:

Morning

1. What data is needed
2. Establishing the menu
3. How will the data be collected

Afternoon

4. Fuel and time measurements
5. Kobo training: inputting fuel and time measurements

Day 2

Morning

1. Interview training with cooking diaries questionnaires
2. Practice: Enumerators interview each other & enter data into Kobo.
3. Kobo admin training: saving, sending, editing forms
4. Complete registration surveys with participants

Afternoon

5. Assign 5 participants to each enumerator based on household location
6. Enumerators interview participants with lead field researcher monitoring

Day 3

Morning:

1. Enumerators visit participant households

Afternoon

2. Upload data to Kobo and review data for inconsistencies with trainers

FAQ:

- Full example training schedule available on ECO Shared Folder
- Who should lead the training?

Participant selection

Convenience sampling is when your sampling method has no criteria other than people are available and willing to participate.

- Advantages: quick, easy, cheap, people usually willing - good for pilot studies and initial hypothesis forming.
- Disadvantages: unlikely to be representative/selection bias issues

Cooking diaries require motivated and capable households, so **convenience sampling** is advised as recording high quality data is prioritised over a nationally representative sample.

Qualities of the most ideal households include:

- one main cook, who is well organized, literate, and interested in the findings of the research study (helps with motivation to record high quality data).
  - the main cook should volunteer to participate, rather than the head of their household volunteering them.
- cooking 2-3 times a day, rather than regularly buying food out or eating at a friend/family member's place.

FAQ. What about using incentives?

- Cash incentives can be an issue if it enables participants to use electricity they couldn't normally afford
- Common household goods could be an option (e.g. soap) but not food which could affect menu choices

Wiring and electricity supply

- All wiring, plug adaptors, extension cables and/or sockets in each household should be:

  inspected to verify it is likely to be strong enough for cooking.

  - Min. of 1.5mm^2 recommended for appliances with combined total power consumption of up to 3kW.
  - Wiring junctions, sockets & plug adaptors should be visually inspected and upgraded if necessary.
  - Check for cracked, exposed wiring, charring and whether number & type of sockets is compatible with the number & plug type of appliances to be tested.

  tested with all cooking appliances to be used during the study operating at full power for at least 1 hour under full supervision.

  - Beware: lower cost electrical hardware may be rated according to the peak power it can support, rather than the continuous load, meaning that it may burn out even below its rated power

- **Replace any unsafe wiring, junctions or sockets**.

Example of unsafe wiring that needs upgrading

Wiring and electricity supply

Electricity supply reliability – blackouts & voltage

- Households will not be able to record data on electric cooking during blackouts or severe voltage dips.
- Using appliances designed for a 220V AC grid, participants are unlikely to be able to cook at all if the voltage dips below 150V and cooking times will noticeably increase below 200V.

FAQ: What to do in cases where there are blackouts?

Example participant training process

Day 1

Morning

1. What data is needed
2. Establishing the menu
3. How will the data be collected

Afternoon

4. Fuel and time measurements and using the notepad form
5. Practice recording fuels and times

Day 2

Morning

1. Participants complete registration surveys

Afternoon

2. Invite participants to be interviewed by their enumerator with trainer monitoring

At home

3. Ask participants to record data in their own home overnight using notepad form. Advise that enumerator will visit tomorrow.

Day 3

1. Participants interviewed by their enumerator at their home
2. Enumerators to assist or report back on any difficulties participants may have

FAQ

- Example notepad form available on ECO Shared Folder
- Notepad form typically includes: date, time, energy measurement before and after cooking, other comments