Technology Options for Clean Cooking Solutions

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In this video you will learn:

- Clean Cooking Fuels
  - Clean Cooking Devices
    - Clean Cooking Practices

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Preamble

- Clean cooking involves using **cleaner fuels** and **energy-efficient/modern cookstoves**.
- Clean cooking solutions involve both the **DEVICES** and **FUEL TYPES**
- **Cultural aspects** plays critical role
- **Enabling environment** plays critical role

Selected (Clean) Cooking Fuels

- Liquid and Gaseous Fuels
  - Liquefied Petroleum Gas (LPG)
  - Liquefied Natural Gas (LNG)
  - Biogas
- Non-wood Solid fuels
  - Biomass Briquettes
  - Others – maize stalks, wheat stalks, rice stalks and dung

Liquid and Gaseous Fuels

Fuel Type	Brief Explanations	Fuel	Stoves
LPG	High efficiency fuel; no pollution; relatively expensive for low-income communities		
LNG	High efficiency fuel; considered clean fuels though comes from fossil sources; required established distribution infrastructure		

Liquid and Gaseous Fuels

Fuel Type	Brief Explanations	Fuel	Stoves
Bioethanol	Produced from ethanol fuel from some plant oils, e.g. palm oil, clean fuel; has low energy intensity than LPG; Requires some special care to avoid evaporation; not available easily		
Biogas	Made through anaerobic process using biodegradable biomass as feedstocks; does not pollute environment		

Non-Wood Solid Fuels and Electricity

Fuel /Solution	Brief Explanations	Fuel	Stoves
Biomass Briquettes	Produced through biochar processes; has high energy content than wood or traditional charcoal		
Electricity	e-cooking/electric stoves using hot plates or induction		

(Clean) Cooking Fuel Efficiencies

Fuel Category	Fuel Type	Calorific Values** (MJ/kg)	Moisture Content	References/source
Liquid and Gaseous Fuels	Natural Gas	51.3		Zhang et al., 2000
	LPG	47.1		IEA, 2005
	Ethanol (pure)	26.8		Schmer et al., 2009
	Biogas	17.7		Smith et al., 2001
Non-Wood Solid Fuels	Charcoal	27.6 - 31.5	5%	Pennies et al., 2002
	Maize stalks	16.1	9.1%	Zhang et al., 2000
	Wheat stalks	14.0	7.3%	Zhang et al., 2000
	Rice stalks	13.0	8.8%	Smith et al., 2001
	Dung	11.8	7.3%	Smith et al., 2001

** Calorific Value: The energy released per unit mass of fuel in complete combustion with oxygen; the amount of energy (per kg) it exudes during combustion

Solar Thermal

Technology Type	Brief Explanations	
Solar Thermal	Uses concentrated heat methods (parabolic); cooking takes place where there is direct sun; suitable for foodstuff that do not require much attention, such as beans; suitable for communal applications, e.g. in displaced settings	

Efficient Cooking Devices

Devices	Brief Explanations	
Efficient /Improved Cookstoves	Designed to be efficient than three-stone/open fire set-up; Improved efficiency (up to 40% saving); reduce fuel requirements for cooking.	
Pressure Cookers	Conserves energy; fasten heating function; reduces cooking time; saves energy.	

Summary

Several factors determine the adaptability of the clean cooking options

- Access to the fuel/technology
  - Urban: LPG, LNG, Electricity, Briquettes, (Biogas)?
  - Rural: Briquettes, Biogas, Dung, Crop stalks, LPG, (Electricity)?
  - Overall: Infrastructure, Supply chain, etc.
- Affordability
  - Pricing
  - Supportive business model (subsidies, payment models, etc)

Additional References

1. *What is clean cooking?* (Netherlands Enterprise Agency, February 23, 2022): https://english.rvo.nl/information/what-clean-cooking#:~:text=Currently%2C%20clean%20options%20according%20to%20WHO%20include%3A%201,ethanol%20stoves%2C%205%20biogas%20and%20specialised%20biomass%20stoves.
2. *Clean and Efficient Cooking Technologies and Fuels Toolkit* (USAID, 2017): https://www.usaid.gov/sites/default/files/2022-05/cookstoves-toolkit-2017-complete.pdf

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