Cooking in Developing Countries - fuel consumption and GHG emissions, user acceptance and incentives

Michael Grupp (Synopsis, France)
Marlett Balmer (PDC, Pretoria, RSA)
Nicolaas Beute (Cape Peninsula University of Technology, RSA)

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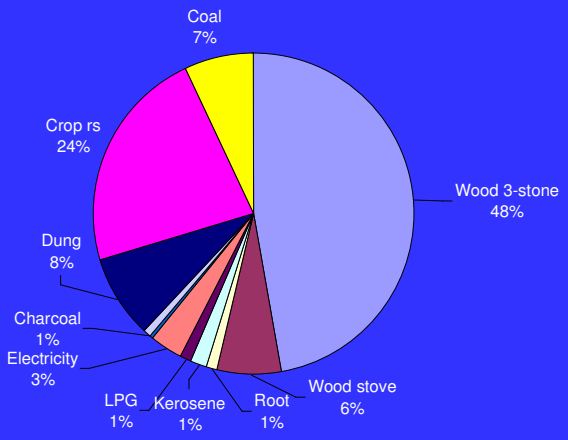
Global consumption of different cooking fuels



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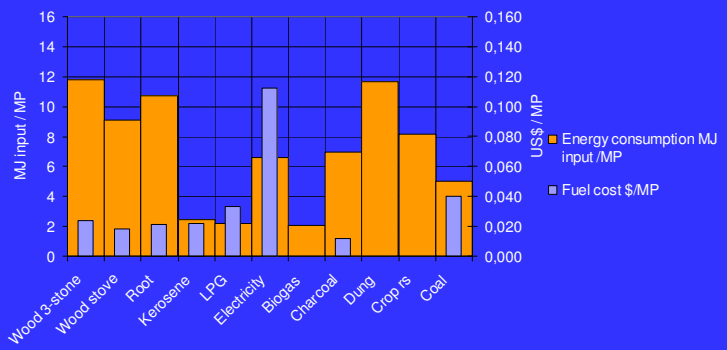
Fuel consumption and cost per meal portion



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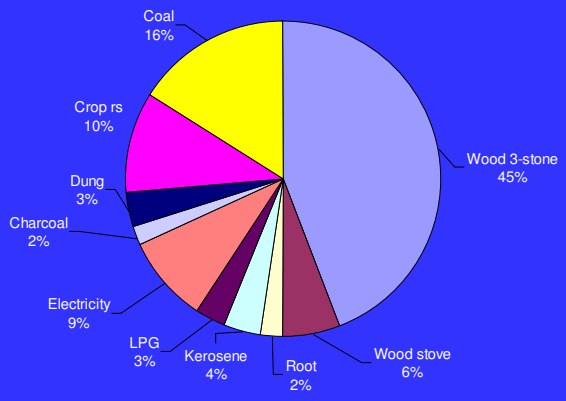
Global GHG emissions by different cooking fuels



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Cooking: the GHG facts

· Cooking contributes around 5% of global GHG

· Most emissions are caused by biomass in developing countries (non-sustainable wood, low efficiency cooking appliances, high number of users - but potential for low-cost improvement)

· Cooking in industrialised countries emits less GHG (less users, cleaner fuels, more efficient appliances).

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Option 1: Gas fuels (traditional and renewable)

Prototype hydrogen cooker

- **Pros**: clean, cheaper than electricity, lower start-up investment
- **Cons**: safety reputation, traditional gas fuels need centralised production and distribution chain, price
- Traditional gas can be replaced by bio-gas or hydrogen.

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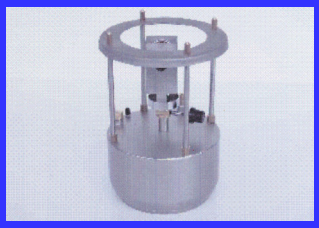
Option 2: Liquid fuels (Kerosene, bio-fuels, syn-fuels)



Plant oil cooker (U. of Hohenheim)

- **Pros** of Kerosene: mostly cheaper than electricity, lower start-up investment for supplier, extremely low start-up investment for user, can be marketed in small lots
- **Cons** of Kerosene: smell, safety (fire and toxicity)
- Kerosene can be replaced by bio-fuels and syn-fuels such as plant oil, ethanol, methanol

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Option 3: Solid fuels (3-stone fires, coal, charcoal and biomass stoves)

Improved wood stove (Vesto)

- **Pros**: free, respectively cheaper than electricity, high acceptance for traditional stoves
- **Cons**: massive contribution to GHG and indoor air pollution, local deforestation for wood.

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Option 4 : Non-fuel stoves (solar)

- **Pros**: zero GHG emission, convenient if used right
- **Cons**: needs change of cooking habits, no stand-alone system, initial investment, stoves need product development and efficient low-cost production/distribution/after sales organisation

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Option 5: traditional grid / electric cooking

Pros: locally clean, polyvalent, convenient, high user acceptance

Cons: high GHG emissions, expensive for user and utility (traditional grid), very low overall efficiency, lack of generating capacity in DC, low return on investment (poor clients)

Conclusion: electric cooking will remain limited to wealthy or subsidised, high user density situations.

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User acceptance - the critical issue

- Clean cookers need acceptance to be effective
- New cooking techniques have a poor acceptance record (coal vs wood, microwave, solar…)
- Acceptance is a complex issue (tradition, convenience, cost, supply, safety, image, …)
- Acceptance can be improved by incentives

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Incentives to boost user acceptance

- Incentives should be directly related to impact - hence to clean cooker use rate
- Incentives should be directed in priority at the user (in contradiction to usual practice), not at the professional
- Collateral effects, e.g. by subsidising fuels instead of use, should be avoided
- Use rates should be metered for impact assessment as basis for incentives - but how ?

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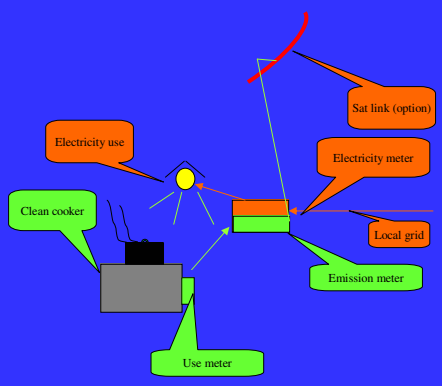
Electricity for clean cooker use - an incentive scheme



The concept:

- Clean cooking is recorded on line and converted into a reward via carbon value
- Cooks get paid for GHG reduction by free electricity (local or central grid)
- GHG metering and billing is “piggy back” on the grid, without additional cost.

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Local satellite grids

Many users in Developing Countries will never be connected to the traditional grid. Their electricity needs can be met by local grids.

Intelligent grid functions such as data transfer, intelligent metering and two-way billing could be provided for by local grids.

Satellite grids: local grids could be synchronised by sat link to become part of the central grid - at acceptable cost

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Open questions

- The technical characteristics and cost potential of tamper-proof use meters
- Technical, financial and user related feasibility of local and satellite grids
- The institutional reaction to the concept
- Will the user give it a try ?
- Will the concept work in the real world ?

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Perspectives 1

- Cooking will remain a complex activity, implying multiple cooking devices for specific uses
- Cooking in Developing Countries is a mass market (more than 1 billion devices in use), between 1000 and 10000 times bigger than today's RE clean cooker market
- The corresponding cash, material and energy flows mean BIG business and will re-shape existing structures

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Perspectives 2

- Cooking cannot rely durably on fossil fuels
- There will be competition between local and central production of RE for cooking; between biological and synthetical production modes, between fuels and non-fuel technologies
- Whatever the outcome may be, user acceptance is key.

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“Free” fuel supply

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Conclusions

- Cooking in Developing Countries causes important GHG emissions and high costs
- User acceptance of clean stoves is still poor - and hard to establish
- Efficient incentives must be based on *actual* use rates
- Use rates can be metered and rewarded via an avoided-emission-for-electricity scheme
- Local grids run either by utilities, investors or users can be synchronised to the traditional grid by satellite control ("satellite grids") which keeps all future options open.

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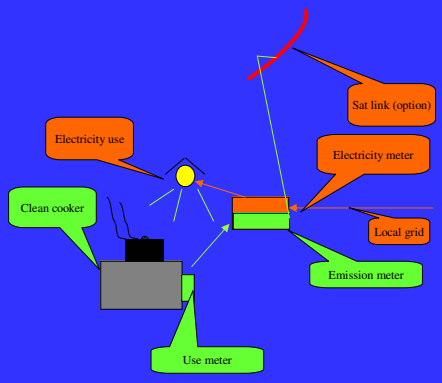
Electricity for clean cooker use - an incentive scheme



- Use metering by single ship data logger
- GHG reduction is converted to free electricity
- Pros: acceptance; adapted to low density locations.

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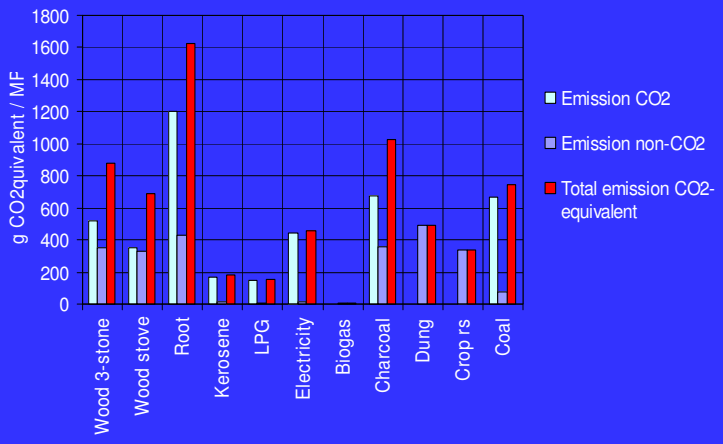
GHG emissions per meal portion by different cooking fuels



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