

Dissemination of Solar Home Systems. Experiences from South Africa and Zimbabwe

Presented at the Workshop on *The Role of Renewable Energy for Poverty Alleviation and Sustainable Development in Africa...*

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Some benefits of PV systems

The most attractive thing about the use of SHS is the fact that it does not lead to emission of CO₂ into the atmosphere like other fuels, and it does not cause indoor air pollution. Remote areas can be electrified in this way. Thus, in spite of its high upfront cost for developing countries, it is unquestionably justified amongst many experts for reducing CO₂ emissions under the Kyoto Protocol. Its attraction is mainly for the Clean Development Mechanism (CDM) with the double potential benefits of improving the quality of life (development) as well as reducing CO₂ emissions. Thus it is becoming fashionable to promote “innovative delivery mechanisms” that would increase the market share of solar energy without paying much attention to the environmental impact of the means of achieving this

COMPARISON OF THE INITIATIVES

<i>Parameter</i>	<i>GEF Solar Project</i>	<i>JICA Study</i>	<i>Chinese donation</i>	<i>Private/DIY</i>
Special system features	Controller, mixed batteries. Wiring in conduit	Controller, deep cycle battery. Wiring in conduit.	Controller, deep cycle battery. Wiring in conduit.	Automotive battery. Some wiring in conduit.
Module size (Wp)	25Wp to 83Wp	25Wp and 56Wp	70Wp	5Wp to 83Wp
Local components	BOS initially	BOS initially	No. Turnkey approach	BOS
Installer sustainability	No long term support	Yes. ESCO	No	Variable
Maintenance	No long term provision	Yes. Local technician	Not planned with project	Limited access
Spares provision	Not beyond project	Not beyond project	Not beyond installation	Variable
Community role	Weak. Unclustered	Yes, clustering & consultation	Encouraged by clustering	No. Unclustered.
Payment scheme	Cash or terms	Service fee only	None - free	Cash or terms

Status of SHS in Zimbabwe

- No comprehensive survey has been undertaken, particularly to look at public facilities (chiefly schools, clinics)
- Dept of Energy, JICA and BUN undertook a limited survey of installed SHSs at the end of 2002. Survey coverage was approx 0.3% of installed systems, and excluded public facilities
 - Results of the survey show that batteries fail most where maintenance is not provided
 - Users tend to be most content where maintenance is readily accessible
 - Long-term trends may not be apparent from this survey

Summary of findings of DoE/JICA/BUN Survey

<i>Parameter</i>	<i>GEF Solar Project (1993-99)</i>	<i>JICA Study (1997-2003)</i>	<i>Chinese donation (1998-99+)</i>	<i>Private/DIY (not a timebound project)</i>
Present system status	63% semi operational	Most working well	Most working well	80% semi operational. Wiring poor.
Component failures	48% batteries 18% lights 12% controllers	14% batteries 43% lights 10% controllers	All controllers, <i>some</i> batteries replaced	50% batteries 25% lights 10% controllers
User satisfaction level	Complaints against some companies	Generally satisfied	Generally satisfied (<i>NB. warranty repairs</i>)	Generally dissatisfied

Summary of income-generating activities benefiting from SHSs in survey areas

<i>Category</i>	<i>Details of income generating activity</i>	<i>Nature of SHS contribution</i>
Handicrafts	Husband makes artificial flowers (for sale) in evenings. Is a teacher during the day. Wife takes school orders for jerseys. Knits by hand in the evenings. Wife sews garments in the evenings. These are for sale or being mended for a fee. Wife sews and knits baby sets for local sale. She works in the fields during the day.	Quality light makes production of handicrafts in evening possible. Producing quality garments for sale is easier with good lighting
Services	Manual peanut butter production. Clients leave peanuts packets, which are labelled by children throughout the day. Father grinds peanuts on manual machine at night; clients collect peanut butter next day. Repair of radios and SHS charge/discharge controllers with electric soldering iron. Barber, using electric hair clipper. Wife bakes scones and other confectionery for sale to primary school children. Day/night baking shifts. Shop/ Bottle store lighting and radio. Husband is a teacher who gives supplementary lessons in the evening and charges for them.	Father works peanut butter-making machine under SHS light. Free for other work during the day. Soldering iron powered by SHS or battery via inverter. Workshop light powered by SHS or battery. Hair clipper powered by SHS or battery via inverter. Night baking shift requires good light, which SHS provides. Quality control easier if product is clearly visible. Powering lights and entertainment from SHS. Teaching at night would not be possible without good light. Teaching at night would not be possible without good light.
Farming related	Two wives involved in gardening. Grading and packing of tomatoes, and bundling of green leaf vegetables carried out at night. Raising poultry for sale.	Grading and packing for sale next day facilitated by good quality light. Solar home system powered light at night allows poultry to continue feeding and grow faster

Summary of patterns

- Non-electrified households show strongest multi-fuel dependence
- Similarities in fuel use & preference:
 - SHS and Grid households use wood for thermal end uses, and elect for lighting and audiovisual applications
 - SHS and Non-electrified households want grid electricity for virtually all end uses
- Grid-electrified households have least desire to switch

Lessons/Issues

- The poor are generally not catered for, PV subsidies benefit the wealthiest rural households
- PV systems do not meaningfully enhance productive activities yet often require regular fees
- No impact on fuelwood use and incomplete replacement of other lighting fuels
- Disposal of Pb and Hg become issues in large scale dissemination
- Standards have been variable and long-term maintenance problematic
- Other options have tended to be overshadowed by PV dissemination, eg energisation initiative in SA.

RECOMMENDATIONS: APPROACH RELATED

- *Community involvement and ownership to ensure long-term maintenance. Projects have not generally provided long-term maintenance arrangements, communities need to be empowered to maintain SHSs.*
- *Community participation to engender sense of ownership and improve security of installations, esp. at public facilities. Thefts of household modules has been less than of modules at public facilities where ownership is less clear. Communities have assisted recovery of stolen modules in ESCO project and donated water pump.*

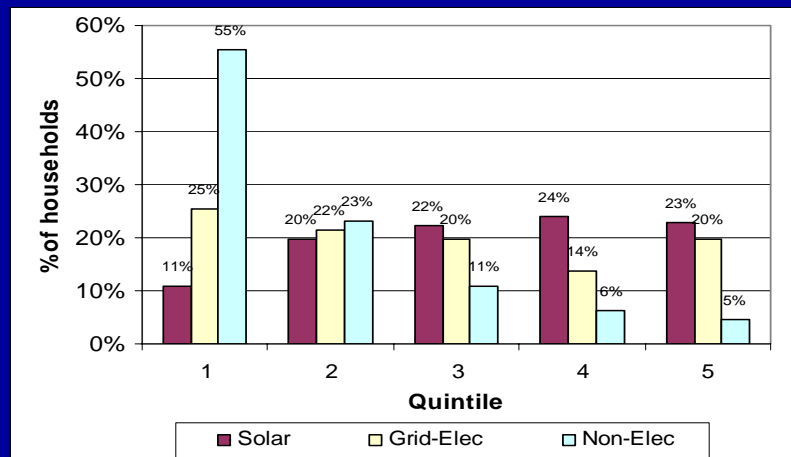
RECOMMENDATIONS: FINANCING RELATED

- *Better focus on the poorer households through better-targeted subsidies and appropriate incentives*
- *Improving collection of payments in rural areas using local resources and systems. This has worked well in the ESCO project where local technicians collect and bank fees locally and payment schedules are flexible.*
- *Financing support for existing, faulty SHSs from new project budgets. The large number of partially functional SHSs damages the image of PV technology*
- *Caution - project tied subsidies and incentives. The GEF solar project had special concessions that distorted the local market.*

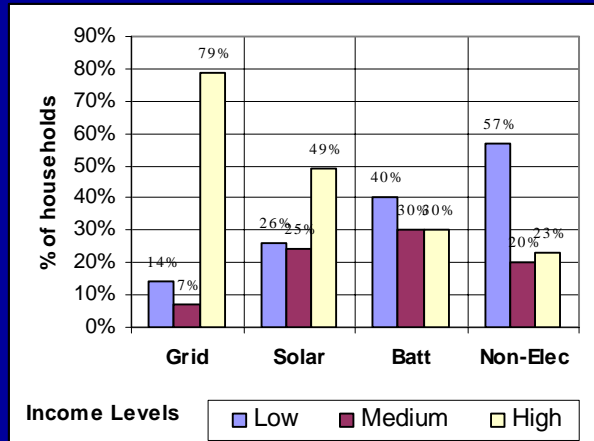
RECOMMENDATIONS: OTHER

- *Augmenting the role solar home systems in poverty alleviation through widening of energy supply options. The power level of SHSs is unsuited for productive use.*
- *More realistic assessment of the environmental impacts of solar PV systems. Also consider project motoring, Mercury and Lead risks.*
- *Ensuring availability of spares for the sustained operation of SHSs. In Zimbabwe spares availability is currently constrained by hyperinflation and shortage of imports. It is preferable to maximise use of local components as was tried by projects besides the Chinese donation.*

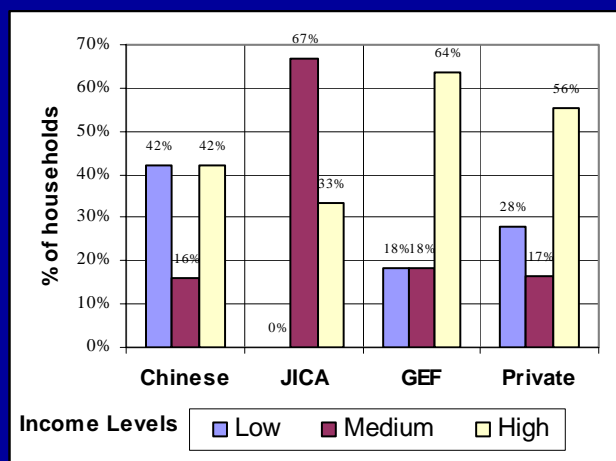
Income quintiles for rural h/holds by electrification category, E Cape



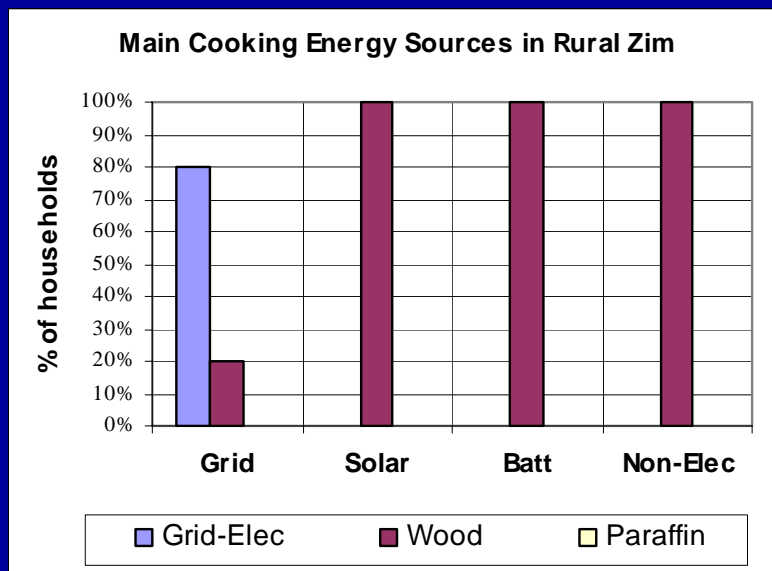
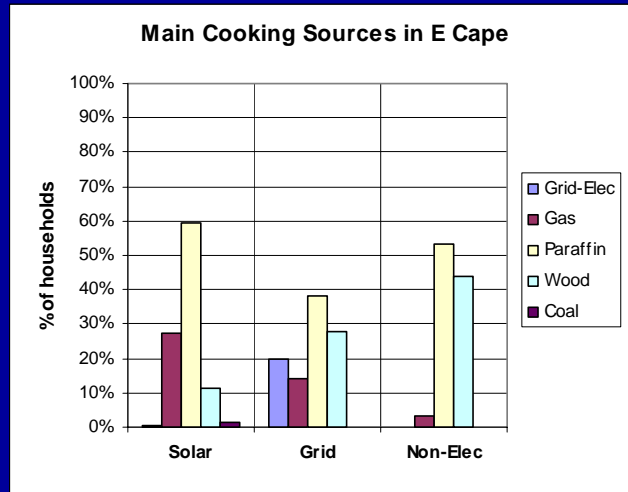
Income distribution across electrification categories in Zimbabwe

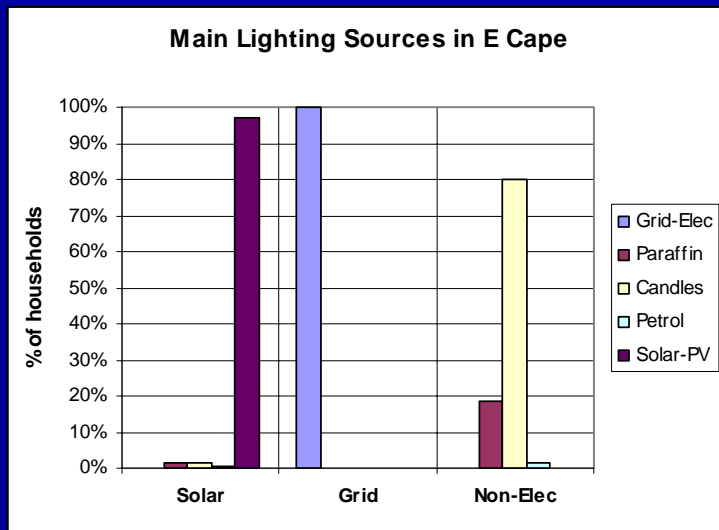


Income distribution among PV dissemination modes, Zimbabwe

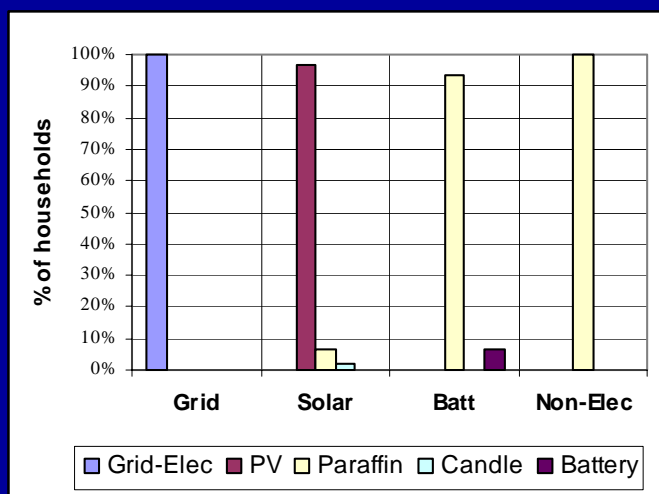


Cooking and lighting fuels

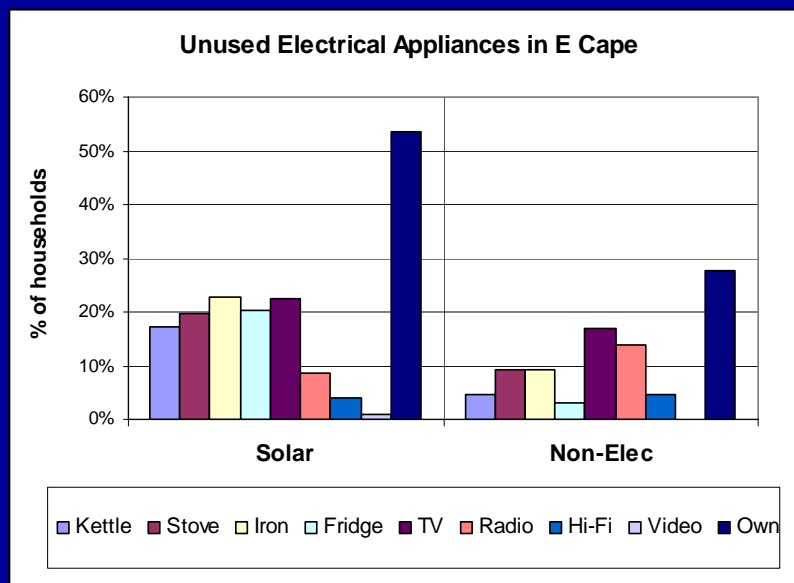
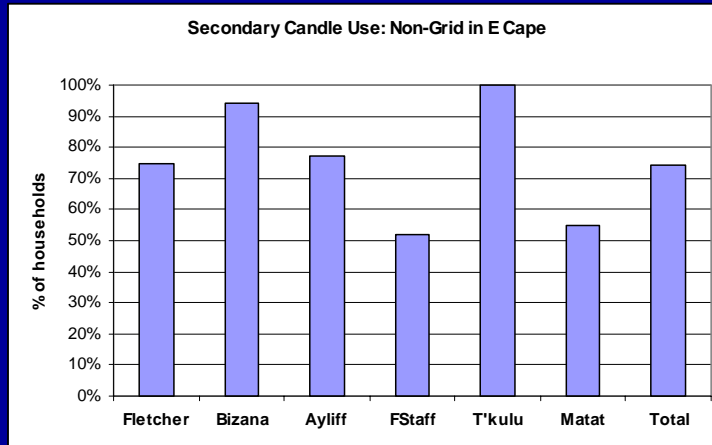




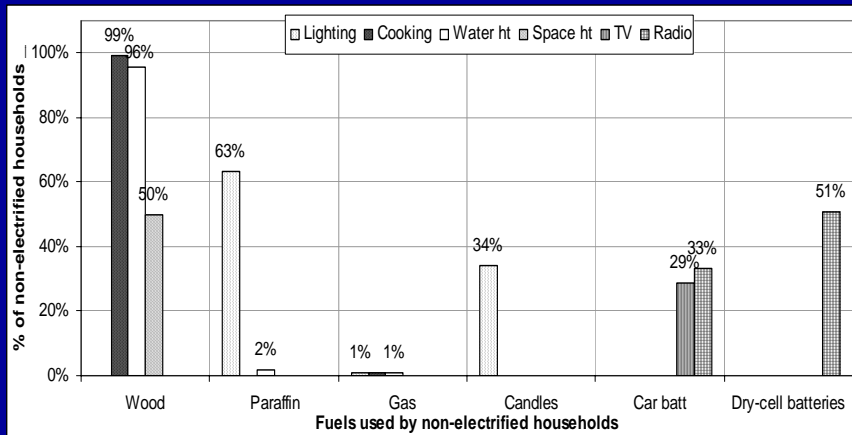
% of rural HH using energy source as main lighting fuel: Zimbabwe



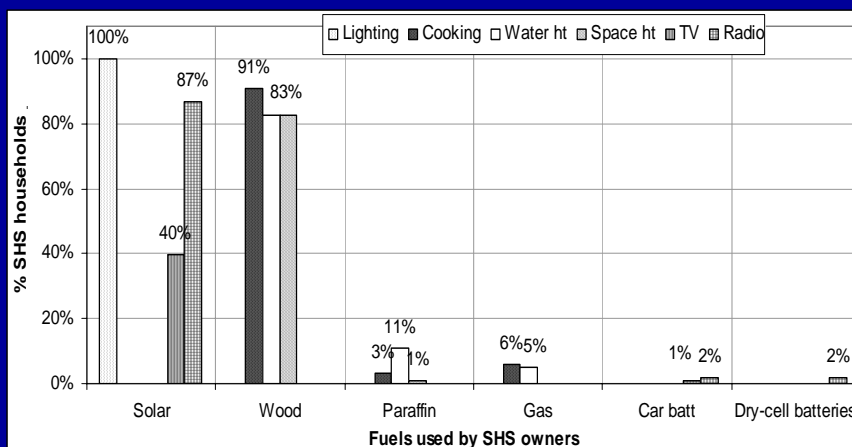
Secondary use of candles for lighting in PV-electrified households



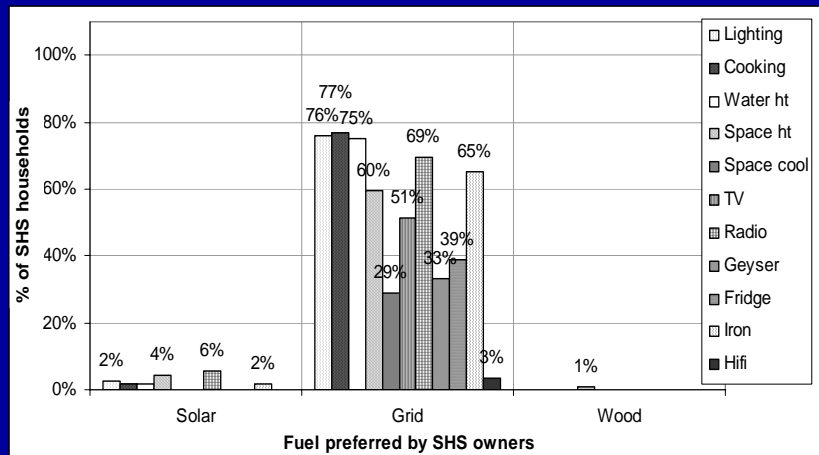
Main fuels used Non-electrified households: Limpopo, SA



Main fuels used Solar system owners



Fuels preferred by Solar system owners



Fuels preferred by Grid-electrified households

