



Biochar stoves: An innovation studies perspective

Enabling Bio-Innovations for Poverty Alleviation in Asia
UK Biochar Research Centre, University of Edinburgh
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Asian Institute of Technology, Thailand

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Team meeting focus topic

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UKBRC



nexus
Carbon For Development

Partners

- The University of Edinburgh is one of the world's top 20 universities, and the School of GeoSciences is a leading interdisciplinary group, which has over 100 academic and research specialists, over 1100 undergraduate and 250 postgraduate students, and has some of the best scientific infrastructure in the UK (www.ed.ac.uk).
- The UK Biochar Research Centre is an alliance that connects research organizations with significant research activity in the UK. The UKBRC aims to serve as a source of robust data and informed objective analysis on this subject to all stakeholders (www.biochar.org.uk).
- Appropriate Rural Technology Institute (ARTI) is a renowned NGO in the field of biomass energy and sustainable agriculture. Two time winner of the prestigious Ashden Awards, ARTI is one of the pioneers in the area of R&D on biochar production and use and ICS innovation in India (www.arti-india.org).
- The programme is part of the 'Enabling Bio-innovations for Poverty Alleviation in Asia Project', managed by the Asian Institute of Technology and is funded through IDRC-CRDI (www.bioinnovationpolicies.ait.asia).



Contents

- Introduction
- Innovation driver
- Understanding the problem
- Understanding the solution
- Assumed benefits
- The reality

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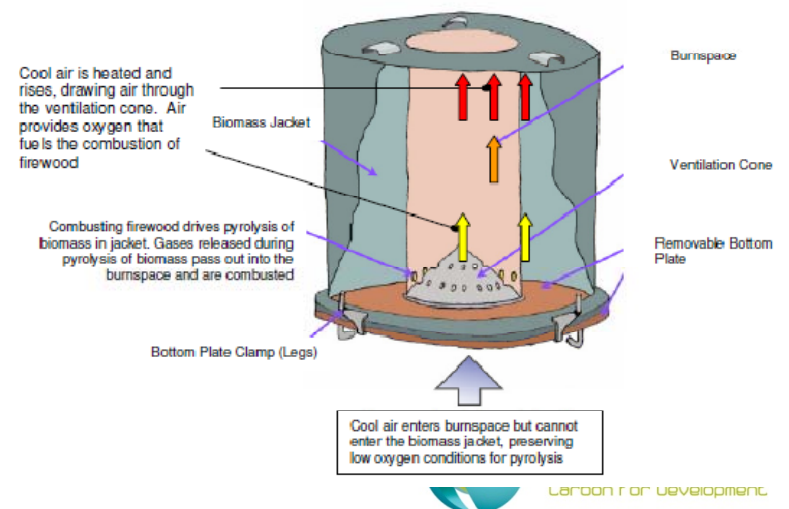
Introduction to Biochar

- Biochar* is the result of heating biomass (including wood and agricultural residues) in a zero to low oxygen environment to produce a charcoal type material, which can be used as a soil amendment.



Introduction to biochar stoves

- Autothermal – fuel is directly pyrolysed during the combustion process
 - Sampada, TLUD, EN
- Stoves which have two chambers, fuel is pyrolysed indirectly in the outer chamber by combustion or gasification in the inner chamber
 - Anila





Biochar stoves

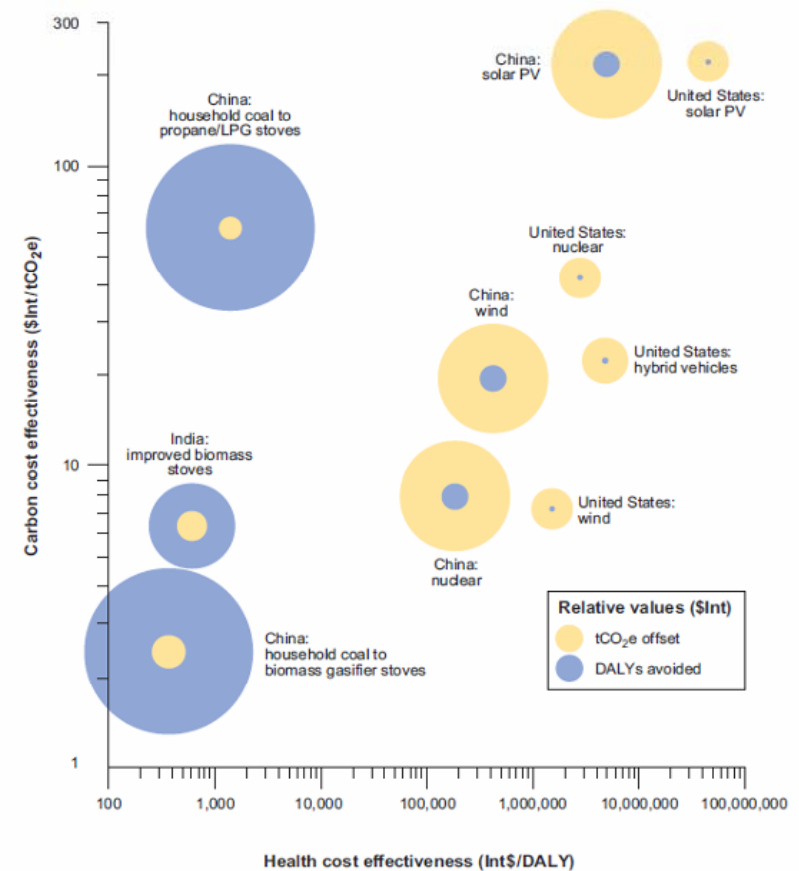


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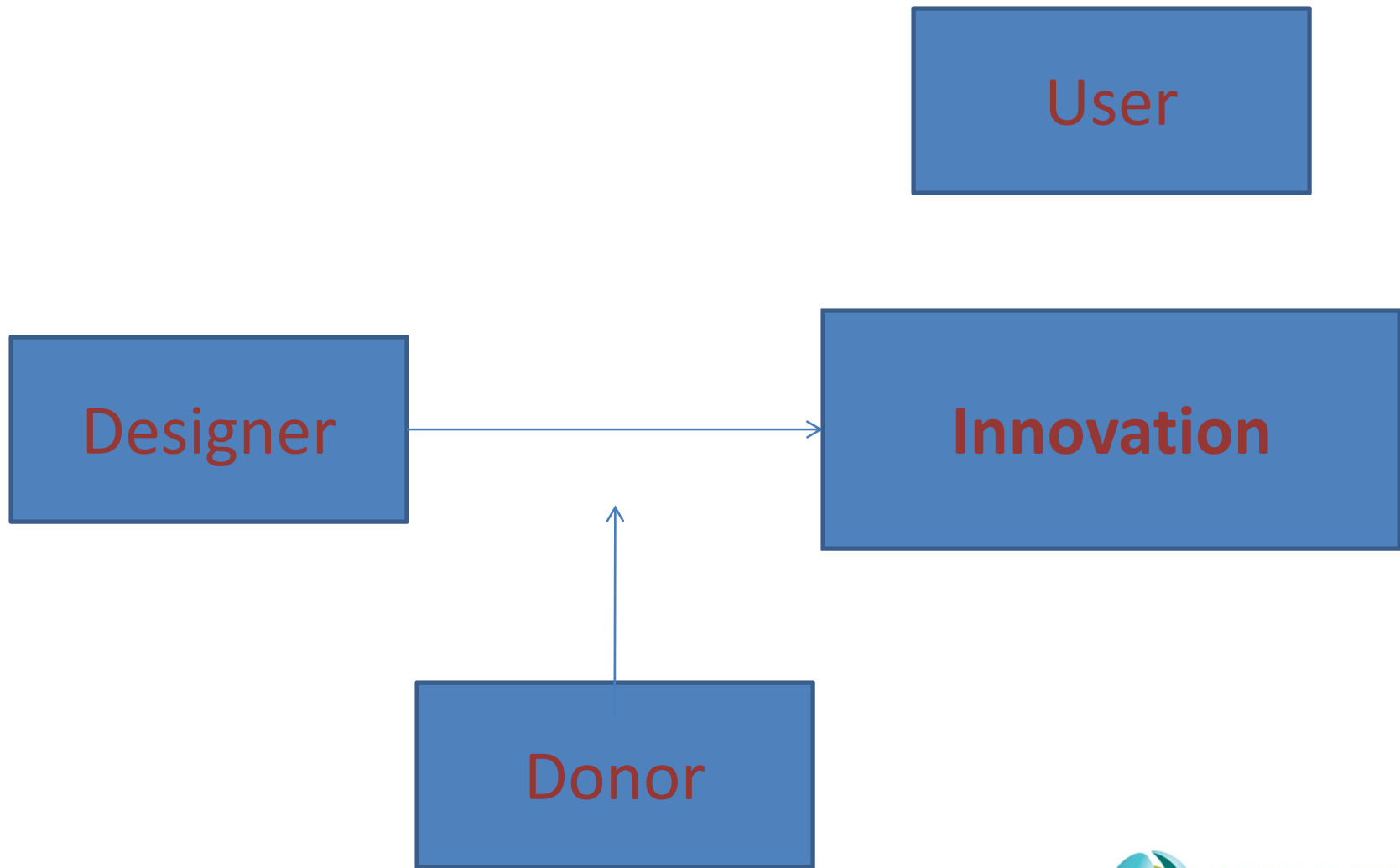
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Innovation driver: Improved for whom?

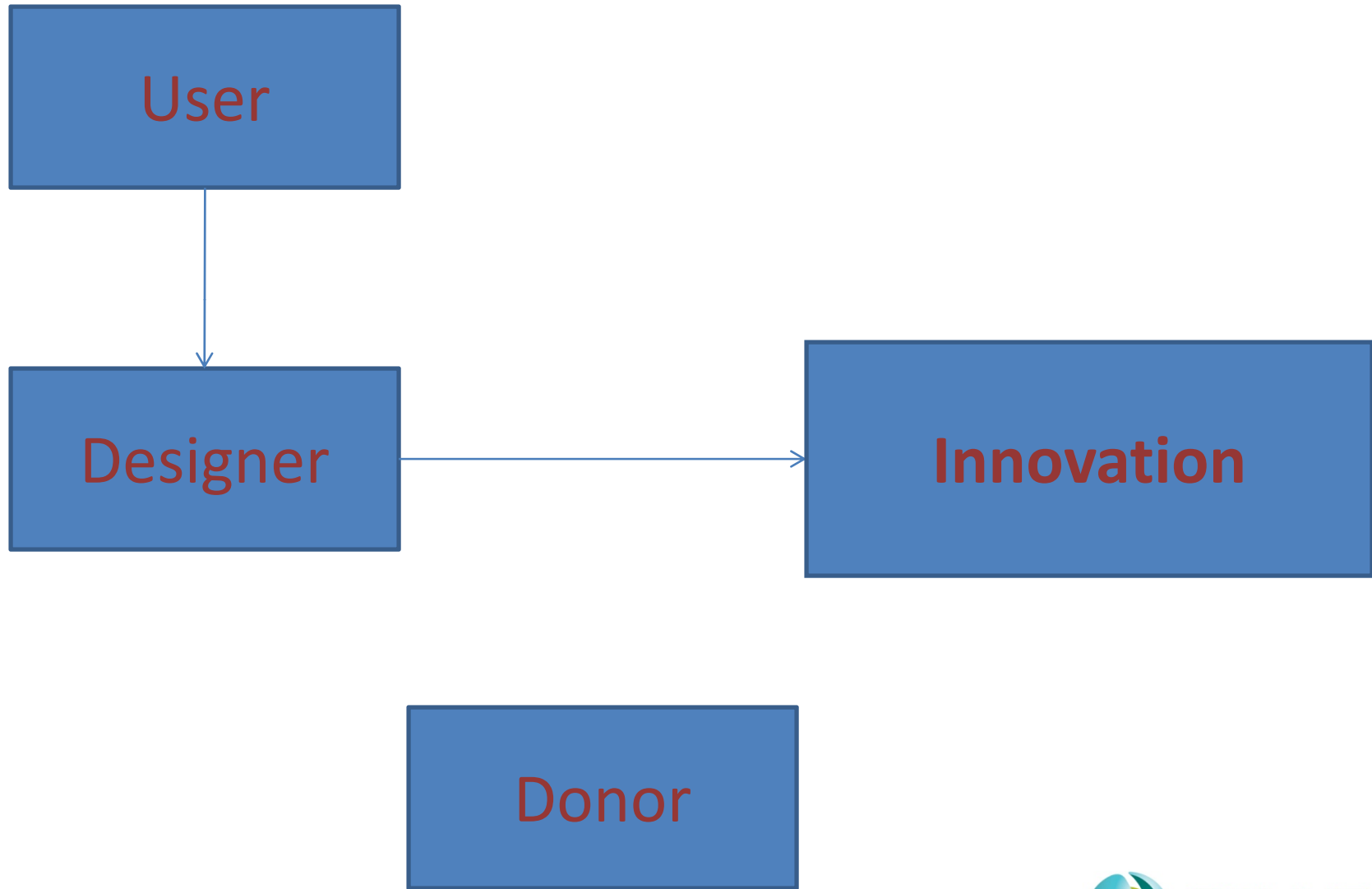
- Reduced fuel consumption
- Reduced AIP
- Contribution to climate change mitigation/
reduction of GHGs



Innovation driver



Innovation driver



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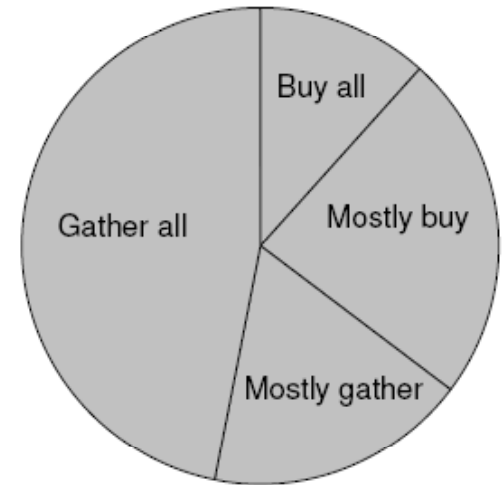
Assumption – problem with Traditional stoves

- Smokey
- Inefficient



Understanding the baseline

- Varied
 - Type of stove
 - Type of fuel
 - Spending on fuel
 - Requirements of cooking innovation
- Moving
 - More movement up the energy ladder was observed in India
 - Future fuel price fluctuations driving change
 - Availability of biomass changing
 - ???



User assessment of baseline stove: understanding the problem

- Unsafe
- Dirty
- Socio-culturally negative
- Fire management required
- Quick to cook
- Ability to cook staples well (rice / roti)
- Can vary flame
- Can add / remove fuel as required

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'Benefits' can be tested

- The WBT determines:
 - time to boil
 - burning rate
 - thermal efficiency (3 stone c.7-8%)
 - Sampada & TLUD c.12%
 - Anila 14%
 - Everything Nice 19%
 - fire power
 - specific fuel consumption
- Other tests
 - KPT
 - CCT
- Other ?



Indepth analysis of the problems with the improved stove - user engagement

- Height of stove
- Lack of turn-up turn-down
- Fuel addition difficulties
- Batch approach
- Fuel uniformity requirements
- Two lids on TLUD
- EN should have grate
- Unfamiliarity (cultural)
- Price – contradicting WTP study

The innovation: What is required from a cookstove?

- Cooking for the family
- Light
- Heat
- Income generation
- Boiling water to drink
- Boiling water for non-food household needs (i.e. bathing)
- Making animal feed
- Curing tobacco
- Other income generation (i.e. textiles)

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Drivers of poverty: problem statement

- >1/3 of humanity, 2.4bn burn biomass (for cooking and heating)
- Over 500,000 women and children die prematurely due to diseases linked with long term exposure to IAP
- Women and children are mainly responsible for cooking and collecting fuel - and leads to back problems
- Gathering wood reduces time to do household tasks and to look for other income streams
- Women produce 60-80% of food in developing countries (UNDP 2009, Warwick & Doig 2004).

Improved stoves and poverty

- Improved stoves produce less smoke and use less fuel so gender issues are a focus – targeting women
- Gasification (biochar producing stoves) can increase agricultural productivity
- Gasification stoves can therefore provide part of the solution for 7 out of the 8 Millennium Development Goals which aim to reduce global poverty (Warwick & Doig 2004).



Drivers of poverty: User assessment

India	Cambodia
Money	Health
Education	Money
Health	Housing
Food	Food
Fuel	Managing the farm
Water	Education
Housing	Fuel
Managing the farm	Water

Livelihood: statement

India	Cambodia
Cooking	Looking after children / elderly relatives
Looking after the animals	Making handicrafts
Washing clothes	Looking after the animals
Working on the farm	Working on the farm
Looking after children / elderly relatives	Going to the market to sell goods
Gathering fuel	Cooking
Fetching water	Gathering fuel
Cleaning	Going to the market to buy goods
Construction on the house	Washing clothes
Making handicrafts	Fetching water

Biochar & poverty alleviation

- Lack of willingness to make biochar
 - Use as a fuel more relevant to the stove context
- Agriculture residues / feedstock not always to available, additional time to gather required
- Competing feedstock uses ('waste'?)- rice husk for palm sugar making, rice straw for cattle
- Difficulty to remove biochar from stove / timing
- Biochar as a soil amendment ?
 - Alternative soil amendments
 - Quantity made / distribution time
 - Lack of trust in biochar
 - Other farming problems – pests, diseases, lack of capital

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A complex reality

- No one stove fits all
- Dissemination methods, i.e. availability of micro-credit etc influence uptake
- Project management – inappropriate timing, lack of local support
- Business model determines stove use

Future focus and further research

- Focus on cook stove user space, analysis of ability of biochar to be included and to provide benefits for cook and household...
- Other methods of creating biochar (for briquettes) – i.e. pronatura and GERES
- Methodology to ensure user perspective included in stove development projects
- Demand-push prioritisation
- Link with carbon finance

Further studies

- Input into research led by ARTI India with University of Edinburgh
 - BIOCHARM project
- Recent proposal to ADB – University of Edinburgh expert input
 - Capacity Building for the Efficient Utilization of Biomass for Bioenergy and Food Security in the GMS
- Care Denmark
 - Gasification stoves study
- University of Edinburgh
 - Biochar and International Development
- Research at Nexus
 - Can carbon finance and the influence on project quality?

Thank you !

Sarah Carter

Alliance Manager

