PROCEEDING
ARECOP PHASE III SECOND PTA MEETING
22-25 January, 2007, Chiang Mai, Thailand

APPENDIX 5

PRESENTATIONS OF ARECOP NETWORK PARTNERS

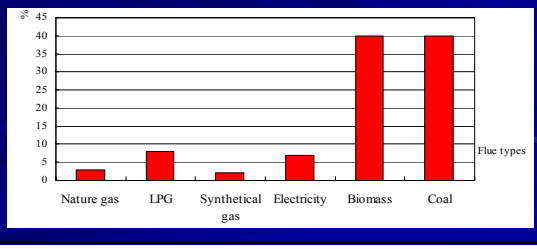
Development of Biomass Stoves in China

Division of Efficient Stoves
China Association of Rural Energy Industry
2007.1. 23

Introduction

Energy structure in rural areas

Biomass is one of the primary fuels for cooking and heating which share 40% of the total energy consumption.



Since 1980, Chinese government designedly conducted the activities of firewood saving in rural areas. After many years efforts, the quantity and scale of stove enterprises has been enlarged continuously with technologies innovation, and remarkable achievements have been obtained in aspects of biomass recourses conservation and environment protection. By the mid 90s, firewood saving stoves have been promoted in 190 million households in all over China, while high efficiency, low emissions stoves for 100,000 sets. In recent years, under the support of some international organizations, a batch of excellent biomass stoves have been selected to promote in Chinese countryside and other developing countries, quickening the course of technology innovation and commercialization.

Development History of Stoves in China

I Primitive phase (before 1980)
Majority of rural households using handmade traditional stoves

II Improvement and dissemination phase(1980-mid 1990s)
Improved stoves was disseminated up to 190 million households

III Innovation phase (mid 1990s-2005)
More than 100,000 set environment friendly stoves was promoted

IV Rapid development phase (after 2005)
The course of technology innovation and commercialization was quickened up

I Primitive phase (before 1980)

The handmade traditional stove was used in the great majority of households before the 1980s, with low thermal efficiency of only around 12%.

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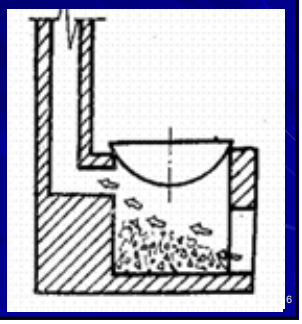
Traditional stoves



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Development History of Stoves in China

I Primitive phase (before 1980)
Majority of rural households using handmade traditional stoves

II Improvement and dissemination phase(1980-mid 1990s)
Improved stoves was disseminated up to 1900 million households

III Innovation phase (mid 1990s-2005)
More than 100000 set environment friendly stoves was promoted

IV Rapid development phase (after 2005)
The course of technology innovation and commercialization was quick up

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II Improvement and dissemination phase (1980-mid 1990s)

1) Firewood Saving stove

The Chinese government established many firewood saving demonstration sites since 1983, and put the "Stove Reforming and Firewood Saving" project in the Sixth 5-Year Plan, providing financial support for dissemination and training and triggering a climax of stove reforming.

Focusing on the disadvantages of the traditional handmade stove, the technicians reformed the structure, making the combustion more complete and utilizing energy more fully.

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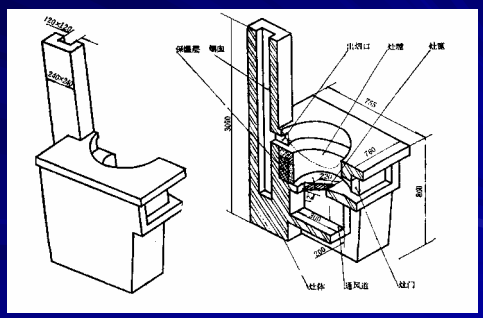
The structure of firewood saving stove



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Handmade firewood saving stoves

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2) Commercial Stoves

In early 1990s, along with the development of markets and the promotion of stoves in rural areas, a number of pre-manufactured commercial stoves were introduced in various areas.

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3) Civil room heating coal stove

- Domestic heating stoves are mainly used in northern China and rural areas without central heating systems. More than 2 million stoves are sold annually.
- Thermal efficiency are 55%～75%

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III Innovation phase (mid 1990s-2005)

1）R & D of semi-gasified biomass stove

The average of thermal efficiency is over 30%, while the highest one can reach to 45%. Fuels the stove uses are quite broad including abandoned stalk, straw briquettes, honeycomb coal and coal pieces. It's most significant feature is it doesn't emit dark smoke, and is friendly to environment and farmers' health.

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2) R & D of compressed fuel and stoves

Pellet
For Wealthy Family

Briquettes
For Ordinary Family

Stick
For Heating boiler

Heating and cooking stove

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3) R & D of low-emissions coal stove

The thermal efficiency of domestic low emission stoves can reach 70% or above, the smoke opacity is less than 1st level Ringelman, smoke density is less than 50mg/Nm3, meeting the strictest national standard for environmental protection.

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IV Rapid development phase (after 2005)

- **Production scale-up**

Enterprises in Beijing, Shandong and Henan have the capacity of manufacturing more than 30,000 sets per year, with continuous increasing speed.

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- **International cooperation quickens further development of biomass stoves in China**

Since 2005, funded by Shell Foundation, and collaborated by China and America, the biomass stoves innovation project attracted 46 enterprises partner, among which, 19 passed the project primary evaluation and 4 were finally gained the excellent award.

Other competition stoves

Chinese biomass stoves in India

In August 2006, a multidisciplinary team of graduate students from UC Berkeley and China Agricultural University conducted extensive market tests in southern Maharashtra on 15 sets of selected stoves from the competition to determine the degree of fit of Chinese stoves to the south Indian market.





Coal stove enterprises were also interested in R&D of biomass stoves



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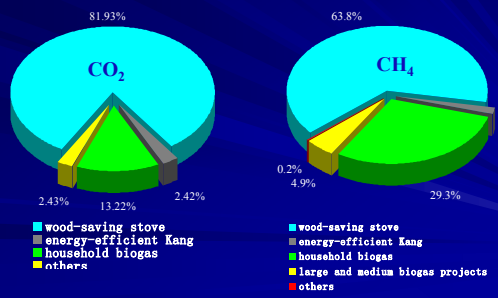
Contributions to GHG emission resulted from the extension and application of rural renewable energy technologies and products in China



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Future strategies (I)

- Encourage more enterprises developing biomass stoves, Improve innovation and quality level, and substitute handmade products with modern ones .
- Improve enterprises' capacity of market competition and commercialization operation with business and management training.
- Improve consumer's consciousness of environment protection and health, and mobilize their purchasing appetite to high-efficiency low-emissions stoves.
- Strengthen the support of funding by various methods, establishing a system to promote innovation.
- Enlarge commercialization scale. Disseminate excellent stoves through demonstration and government subsidy in western depressed area.

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Future strategies (II)

- Building international internet platform of stoves and in door air quality in cooperation with international organizations and experts, to introduce China stoves technologies to other developing countries and strengthen communication.
- Cooperating with international organizations, China will investigate and analysis the consumption lever, living habits and fuel types of other countries, to develop market promotion model and sustainable commercialization ways.
- Promoting excellent stoves abroad by transferring technologies or build factories in cooperation to make stoves at local

Taking Improved Biomass Fuels and Cooking Devices to Rural People: ARTI Experience

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Project Coordinator,

Appropriate Rural Technology Institute (ARTI)

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APPROPRIATE RURAL TECHNOLOGY INSTITUTE (ARTI): AN INTRODUCTION

- Founded by a group of scientists, technologists and social workers in April 1996
- Develops and transfers innovative rural technologies to rural people for income generation and improving their quality of life
- So far, more than 25 technologies developed
- Successful commercialisation of several of these technologies pertaining to agri-horticulture and renewable energy

EXPERIENCE & ACHIEVEMENTS IN BIOMASS ENERGY

- Technical Back up Support Unit for Maharashtra and Goa states under National Programme on Improved Cookstoves (1996 – 2002).
- Organised International Conference on Biomass based Fuels and Cooking Systems (BFCS 2000) in Nov 2000.
- Ashden Award for Renewable Energy 2002 for chain of technologies aimed at converting agricultural waste into domestic cooking fuel, and using the fuel in a clean and efficient manner.

EXPERIENCE & ACHIEVEMENTS IN BIOMASS ENERGY

- Pilot project aimed at commercialisation of improved biomass fuels and cooking devices in India, with funding from Shell Foundation (2003-2005).
- Field Testing of Compact Biogas system, funded by United States Environment Protection Agency, under Partnership of Clean Indoor Air (2004-2006)
- Expertise acquired in indoor air pollution measurements and quantification under field conditions, with assistance from University of California, Berkeley, USA.

EXPERIENCE & ACHIEVEMENTS IN BIOMASS ENERGY

- Dr. Priyadarshini Karve awarded World Technology Award 2005 in Environment Category, by World Technology Network, New York.
- Ashden Award for Sustainable Energy 2006 in Food Security Category for the compact biogas system based on starchy or sugary feedstock.

EXPERIENCE & ACHIEVEMENTS IN BIOMASS ENERGY

- Scaling up Commercialisation of Improved Biomass Fuels and Cooking Devices (2006 onwards).
- Focus on fuel specific stoves (2005 onwards).
- Consultancy offered to other stoves programmes for indoor air pollution quantification (2006 onwards).

OBJECTIVE OF COMMERCIALISATION PROJECT

❖Develop and Disseminate **Clean**, **Efficient** and **Affordable** Technologies for Using Biomass Fuels for rural household cooking needs.

❖**Important Features:**

- ✓ Wide range of products to meet diverse needs
- ✓ Involvement of grassroots level Peoples' Organizations
- ✓ Commercial approach

CURRENT PRODUCTS

MORE ABOUT ARTI BIOGAS…

Dung-based Biogas		ARTI Biogas
40 kg dung + 40 lit water	Quantity of daily feedstock	1-1.5 kg feedstock + 10 lit water
40 days	Reaction Time for full utilization of feedstock	48-72 hrs
4000 lit	Standard size for household	1000 – 1500 lit
Rs.20,000	Cost of System	Rs.10,000

NEW DIMENSIONS…

- Branded biomass fueled stoves from multinational companies.
- Development and dissemination of improved biomass fuels and cooking devices being explored as a candidate for Corporate Social Responsibility projects by big corporations.

Philips Woodstove undergoing field testing in Mulshi, India

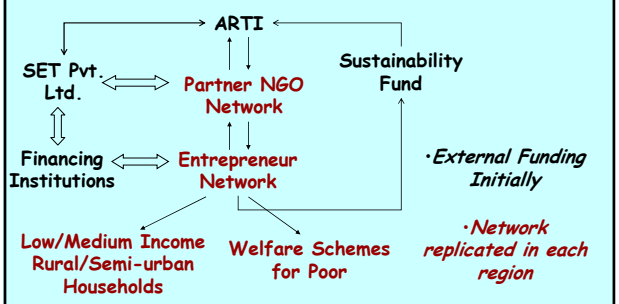
MARKET SEGMENTS

Fixed stoves → Medium and Low Income Rural; BPL Rural
- Fuel: Woody biomass and fuel wood
- Cost: Rs.300-1000

Portable Stoves → High and Medium Income Rural; High and Medium Income Semi-Urban
- Vivek stove: sawdust & powdery biomass
- Sarai system: charcoal or char briquettes
- Gasifier stoves: wood chips or pellets
- Cost: Rs.500-2000

Compact Biogas System → High Income Semi-Urban; Medium and High Income Urban
- Floating dome type biogas plant & biogas stove
- Water-miscible starchy feedstock
- Cost: Rs.5000-15,000

THE RURAL ENERGY ENTREPRENEURSHIP MODEL



SAMUCHIT ENVIRO-TECH (SET) PVT. LTD.: AN INTRODUCTION

- A private limited company established as a commercial partner of ARTI, in 2005.
- Founder Directors: Dr. A.D. Karve, Mr. R.D. Deshmukh and Dr. Priyadarshini Karve (all of whom are members of ARTI).
- Experience and Expertise in Technology Development as well as Technology Commercialization

Objective

Re-establishment of rural entrepreneurship based on appropriate technology, with special emphasis on rural energy sector.

CURRENT PARTNERS IN NETWORK

Western Maharashtra
- Sahyadri Technical Services Industrial Co-op Soc Ltd, Phaltan
- Shramik Janata Vikas Sanstha, Satara
- Heart Development Society, Kolhapur
- Maharashtra Arogya Mandal, Pune
- Nirdhar Sanstha, Solapur

Khandesh
- Disha Foundation, Nasik
- Yuvamitra, Sinnar
- Baglan Seva Samiti, Baglan
- Savali Sanstha, Dhule

Vidarbha
- Gramvikas Tantra Niketan, Wardha
- Srijan Sanstha, Pandharkawda
- Asmita Institute for Development, Yeotmal
- Amhi Amchya Arogyasathi, Gadchiroli

Konkan
- Ratnagiri Zilla Khadi Sangh, Sindhudurg
- Bharatiya Kashtakari Rayat Sanstha, Ratnagiri
- Sahyog Pariwar, Mumbai

Marathwada
- Samajik Arthik Vikas Sanstha, Kerwadi
- Halo Medical Foundation, Osmanabad
- Lokdeep Manav Vikas Sanstha, Parbhani
- Pratik Sevabhavi Sanstha, Beed

ACHIEVEMENTS…

Upto 2002

As Technical Backup Support Unit in National Programme on Improved Cookstoves:

✓ Introduced entrepreneurship training
✓ By 2000, a group of 12 potters in Western Maharashtra had become a model of improved stove entrepreneurship.

2003 to 2005

Shell Foundation funded Pilot Project:

✓ **10 NGOs** and **120 entrepreneurs** active in Maharashtra state
✓ **75,000** improved cooking devices sold

… & PLANS

2006 to 2009

Scale Up:

- 30 NGOs, ~300 entrepreneurs, >1 million devices to be sold in Maharashtra and Gujarat through SET Pvt. Ltd.
- Sustainability Fund to ensure NGO-entrepreneur network continuity

2010 & beyond

Beyond Scale Up:

- ARTI-NGO expenses from sustainability fund
- ARTI continues to develop new products
- Enterprises and SET become self-sustained
- SET explores new markets…

ENTREPRENEURSHIP TRAINING





THE ENTERPRISES

Sales outlet


Production Units

AWARENESS ACTIVITIES

Main Focus…

- Village level Awareness programmes by NGOs
- Participation in regional level exhibitions/events by ARTI/SET

Other Activities…

Through Print Media

- Interviews in state level newspapers
- Weekly series of articles on biomass energy for rural households in a leading newspaper with a wide circulation in rural areas of Maharashtra
- Publicity in local newspapers by NGOs and entrepreneurs
- Publicity through stickers, laminated photographs, pamphlets, etc

AWARENESS ACTIVITIES

Through Audio-Visual Media

- Interviews in television channels and radio
- SET product catalogue available on ARTI website
- Publicity in local television channels by NGOs and entrepreneurs
- Video film shows

Through Public Outreach Programmes

- Public talks, participation in seminars, symposia all over the state
- Sales and Demonstration outlets
- Local exhibitions, events covered by NGOs and entrepreneurs

BUSINESS BLUEPRINT

PRODUCT	Manufacturing	Final Product	'Enterprise'/ 'Entrepreneur'?	Notes...
Fixed Stoves	In workshops using accessories kit supplied by SET	Installed in user home by entrepre neur	Individual potter or mason or SHG	*Enterprise may consist of few members in manufacturing & few in installation..*
Portable Stoves	Central (off the shelf products)	Users start using as per instr manual	Small shopkeepers or itinerant salespersons or SHGs	*Supply of processed fuel is essential, addnl business opprtn...*
ARTI Biogas	Kit provided by SET, tanks left to user choice, assembled on location	Installed and commission ed by installer	Well established small businessmen with trained workers as installers	*Reqs installer's attention for ~ 30 days till smooth opertn begins..*

CURRENT SITUATION

- ~ 100 enterprises active since August 2006.
- About 1000 products sold per month so far.
- The demand is picking up now.
- Addition of new products to the portfolio is accelerating the progress.

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