

Gender, Modern Biomass Energy Technology & Poverty: Case Study in Sri Lanka

Energy



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Energy Sector

Key Features

- Biomass provides 50% of primary energy;
- Annual Consumption is 10 million tones;
- Monetary value is US\$440 million;
- Household sector consumes nearly 81%;
- Petroleum provides 42% of primary energy;
- Hydro power contribute 8%.

National Energy Policy?

Ministry of Irrigation, Power and Energy indicated following areas:

- Providing basic energy needs;
- Reducing dependence on imported energy and diversifying energy sources;
- Optimum mix of energy sources;
- Optimization of the use of available sources;
- Energy conservation;
- Forest and non-forest woodfuel resources;
- Appropriate pricing policy & price stability;
- Continuity of energy supply;
- Capabilities to manage energy sector.

Trends in Energy Sector

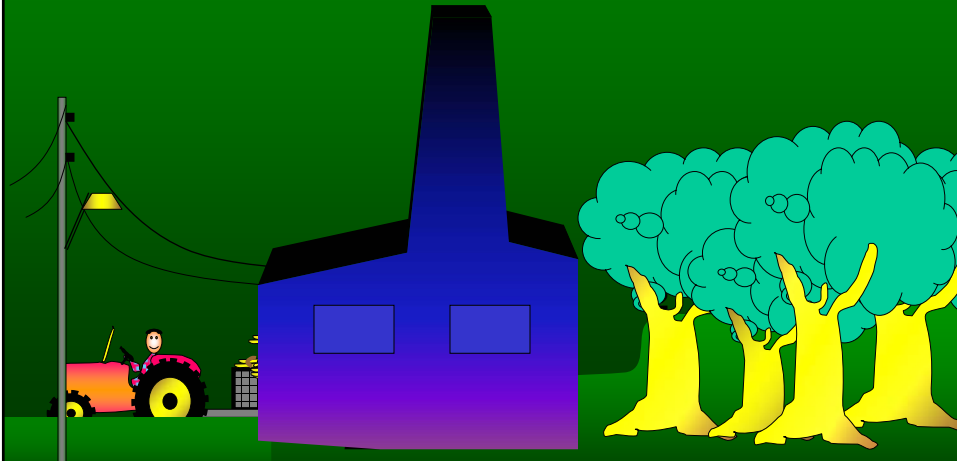
- Rural electrification;
- Decentralization;
- Renewable energy;
- New partnership;
- Dendro-energy development;
 - To generate 1800 Mw of electricity from biomass;
 - Two modes are used – electricity for national grid and electricity for off-grid supply.

Growing Our Own Energy

Fuel Wood Collection/Transport

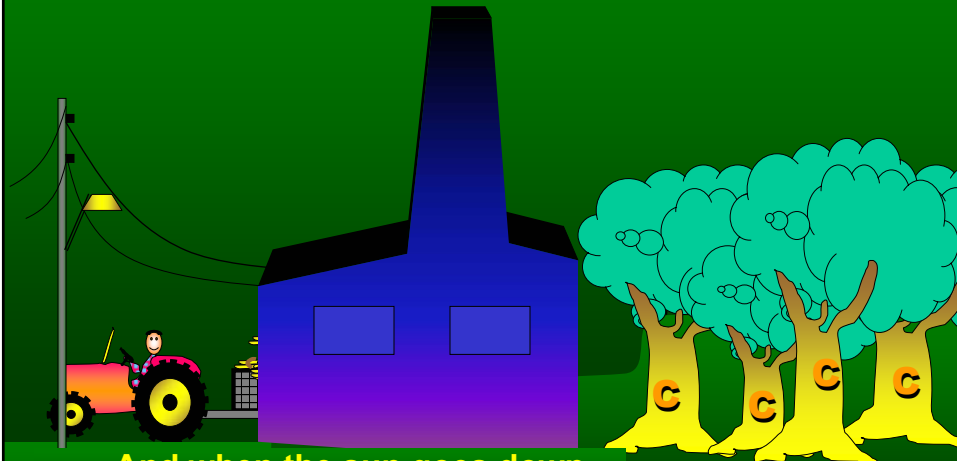


Growing Our Own Energy



But now we have the trees to absorb it

Growing Our Own Energy



And when the sun goes down

N N N N N

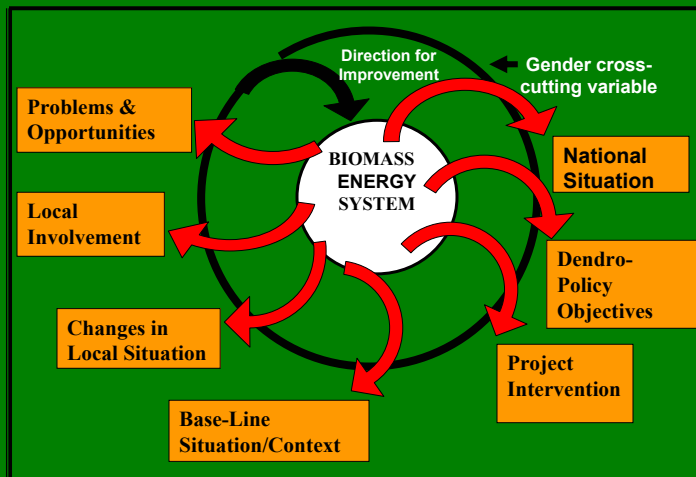
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Focus – Key Research Questions

- Do gender relations constitute a key variable in designing dendro-energy intervention & contribute to achieving the goals of interventions?
- Does dendro-energy intervention most effectively contribute to the process of improving the wellbeing & empowering women and how can it best do this?

Figure 1. Analytical Framework using gender as a key variable

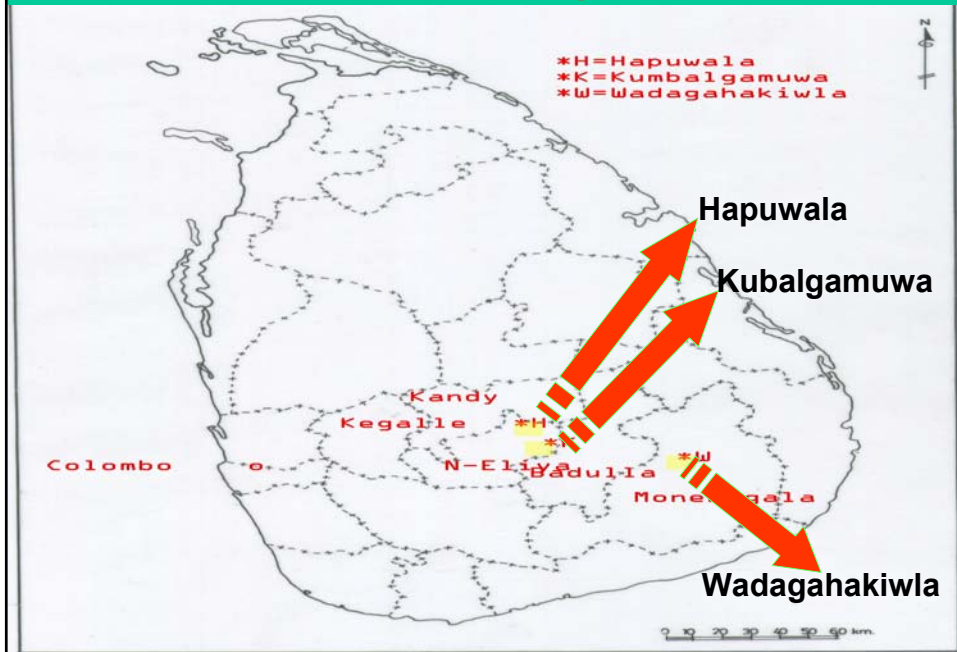


Methodology

Combination of methods were used:

- Participatory methods;
- Field measurements and observations;
- Ethnographic records;
- Questionnaire survey;
- Field mapping.

Location of Study Areas



Typology of situations covered in this study

Aspect	Kumbalgamuwa	Wadagahakiwla	Hapuwala
Energy intervention	Project on dendro-energy for national grid	Project on dendro-energy for off-grid	No project – biomass for local use
Mode	Private sector energy entrepreneur	Community-level organization	Traditional (household-based)
Partnership	State agency, private sector, local suppliers, local feedstock producers	NGOs, community organization, local producers supplying feedstock	Individual household responsibility
Decisions	Energy entrepreneur and supplier	Community organization Dendro-power, Electricity consumer society and NGOs	Household - women in particular
Technology	Externally introduced, Raw biomass for modern-clean (electricity) power generation Combustion in cooking	Externally introduced, Raw biomass for modern clean (electricity) power generation, and raw Combustion in cooking	Locally evolved, Raw biomass combustion in cooking.
Operation	Private management	Community management	Household/women
Output	Electricity for the national grid	Electricity for lighting, community-use	Biomass combustion for cooking

Dendro-energy Development for National Grid - Kumbalgamuwa

Key Features:

- Total number of households – 1165 in 7 villages;
- Study covered 215 households;
- 95% of the land owned by men;
- Exclusively rural nature;
- Livelihood – land & agriculture;
- 70% of women are in agriculture;
- 50% of men are in agriculture;
- Lack of permanent & regular sources of income;
- Seasonal employment;
- Grid electrification in every village;
- Use of woodfuel as a cooking energy;
- Inequalities in accessing safe drinking water;
- Sanitary facilities; and
- 51% of Households got grid electricity for lighting, 49% use kerosene

Energy use by households and responsibility of men and women

Energy type	Cooking	Lighting	Production	Transportation/travel	Responsibility	
					Women	Men
Woodfuel	100	00	--	--	100	10
Bio-gas	15	00	--	--	16	84
Kerosene	00	37	--	--	88	12
Electricity	03	60	01(welding)	--	36	64
Solar	00	02	--	--	00	100
Diesel	--	01	--	17	00	100

Biomass combustion and gathering

Human energy allocated in cooking	% households	Woodfuel/biomass collection and supply	% of household
Wife alone	76	=	74
Wife with some help from husband	14	=	08
Wife with some help from daughter	08	=	11
Wife with all others in family	02	=	00
		Hired labour	07

Nature of involvement by gender

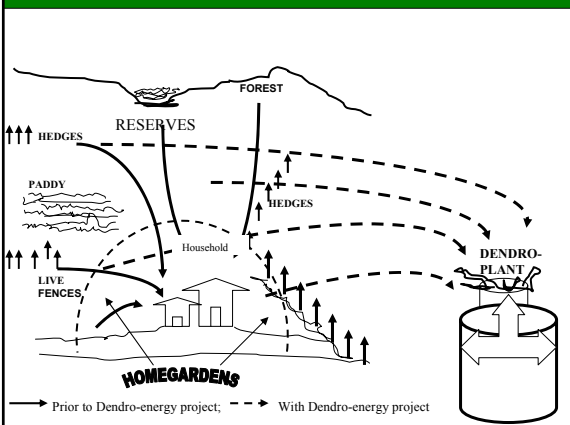
Involvement in the project	No of household involved	% men	% women
▪Project designing phase	00	00	00
▪Providing base-line information	168	82	18
▪Attending to awareness raising made by CTC	108	82	18
▪Reacting negatively to dendro-plant establishment	122	54	46
▪Workers in the plant	06	100	00
▪Organizing supply	12	100	00
▪Organizing production	40	94	06
▪Processing (producing 3-4 inch chips for the boiler)	24	100	00
▪Receiving project stimulations			
▪Dairy	04	family	
▪Compost pits (to use <i>Gliricidia</i> foliage)	12	93	07
▪Farm intensification subsidy – (pepper vine for <i>Gliricidia</i>)	12	92	08
▪Soil conservation measures/erosion reduction (<i>Gliricidia</i> raws grown along contours)	18	100	00
▪Enhancing vegetal cover by growing <i>Gliricidia</i> at 1 meter intervals in farms, homegardens	12	100	00

Figure 3. Changes in men's and women's responsibilities

	PRE/PROJECT SITUATION %			PROJECT SITUATION %		
Hedges, Fences in farmland			PLANTING + NURTURING			Farm intensification
	NA		SUBSIDY LINKS			Enhance production
For household use			COPPACING			For dendro plant
Household use			COLLECTION			For suppliers
Trimming, debarking			PROCESSING			Chipping, drying.
			SELLING			For local supplier
Free day to day supply			SUPPLYING			For the agent
	NA		AGENT			Supply to plant-site
Men						
Women						



Woodfuel Flows From Supply Systems



Reasons for lack of women's involvement in Dendro-energy development

Reason	No. reported as a problem	Rank
Land scarcity	162	12
Lack of organizations for women to link-up	163	11
Lack of capital to enter supply chain	136	15
Lack of contacts with private sector/agency	148	13
Neglect of women's concerns by men – land owners	192	04
Preference of having farm space for food production	164	10
Reluctant to grow woodfuel as a cash crop	190	06
Poor technological knowledge	120	16
Lack of common/own land for growing <i>Gliricidia</i>	146	14
Lack of economic benefits for women	190	06
Lack of trust on CTC & private company	176	09
Reluctance to lose food producing space	184	07
Preference for having farm woodfuel for the Hh. Use	194	03
Reluctance to divert their sources	190	05
It does not provide benefits/solution to family & community energy needs	198	01
Reluctance to lose women's control over land	158	12
Project does not offer answers to poverty & reducing poverty	196	02
It is designed to provide profit for companies and the rich	191	05
Income and employment opportunities are insignificant	182	08

(Ranking of reasons by number of reporting)

Ranking of the problems of dendro-energy project

Problem	Perceived problems	No concern	Total responded
Loss of women's control over village woodfuel source	162 (80*)	41	203
Tendency for them to depend on leftovers	134 (69)	60	194
Alienation of women's energy use & needs	176 (83)	36	212
Loss of control over farm use & woodfuel production	161 (70)	66	227
Loss of control over decisions	148 (78)	49	190
Diversion of women's woodfuel sources for National grid	160 (83)	72	192
Lack of energy benefits for family	174 (81)	41	215
Control of woodfuel by private sector	161 (80)	40	201
Lack of local control over the system	141 (70)	61	202
Lack of opportunities for women to involve/get benefits	132 (69)	58	190

* (Number in bracket refers to percentage)

Limitations:

- Farmers are not committed to produce for dendro-plant;
- Intermediaries control the supply chain;
- Women are not recognized as farm managers;
- Income is handle by men;
- No employment opportunities are generated to improve income & livelihood; and
- Production/supply is not organized to have a control over the system.

Traditional Biomass Energy System in Hapuwala

Key Features:

- 1980s village electrification for lighting;
- 59% of households use electricity for lighting, others use kerosene;
- Biomass remains sources of cooking energy;
- From 60s to 90s biomass energy for tobacco curing;
- Severe land degradation & adaptation of SALT;
- 316 households in the village;
- 60 households consists of 267 people;
- Agriculture is the primary income for 68%;
- Agriculture is the second resource for 32%;
- Vegetable cultivation is predominant;
- For 76% of women & 62% men main occupation is farming;
- 93% of land owned by men;

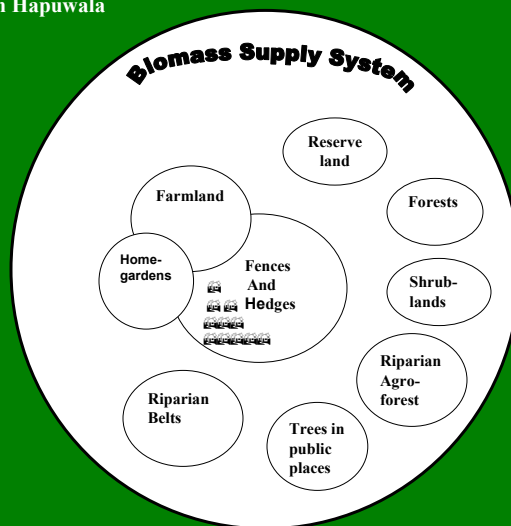
Technology using biomass and the reason for each type	
Hearth type	Reasons for using/advantages
Semi-circular mud hearths (100% of the households)	<ul style="list-style-type: none"> ▪ Easy to construct, manage and repair; ▪ Need less woodfuel; ▪ Residues could be burnt; ▪ Less smoke; ▪ Energy is not lost, and released energy is captured for food processing; ▪ Construct double or triple units on a line in a narrow space; ▪ Enough heat/smoke is released for drying food in smoke trays and for conserving seeds, nuts and food; ▪ Hearth heat remains for keeping water warm for drinking and preparing tea; ▪ Technology and materials are local.
Three stone hearths (62% of the households)	<ul style="list-style-type: none"> ▪ For cooking large pots for social occasions and farm workers; ▪ For processing food; ▪ Par-boiling rice; ▪ For using unsplit segment of logs, roots and thorny wood; ▪ Easy to construct fixing 3 stones/bricks and use it as needed; ▪ Ability to move and fix outside the kitchen.
Improved stoves (42% of the households)	<ul style="list-style-type: none"> ▪ For cooking small family pots; ▪ Less woodfuel is required; ▪ Less smoke.

Gender specific roles for sustaining the system			
Role	Task	Activity by gender	
		Women	Men
Management of supply system	<ul style="list-style-type: none"> ♣ Maintaining trees in homegardens & farms; ♣ Up-keeping fences & hedges; ♣ Conserving state property (forest & reservations). 	<ul style="list-style-type: none"> ♣ Enrichment planting; ♣ Nurturing; ♣ Collective engagement in gathering woodfuel from state property; ♣ Manage coppice growth from tree stumps. 	<ul style="list-style-type: none"> ♣ Enrichment planting; ♣ Coppicing & branch pruning.
Activate woodfuel supply mechanism	<ul style="list-style-type: none"> ♦ Gathering & portaging wood from outside sources. 	<ul style="list-style-type: none"> ♦ Collection of agro-residues; ♦ Collection of woody biomass; ♦ Trimming; ♦ Carrying for domestic use; ♦ Processing; ♦ Maintaining stocks. 	<ul style="list-style-type: none"> ♦ Harvesting (occasional); ♦ Cross-cutting; ♦ Transportation in trucks (rare & limited to special occasions).
Woodfuel consumption for generating energy for cooking	<ul style="list-style-type: none"> ♠ Efficient combustion of wood & agro-residues. 	<ul style="list-style-type: none"> ♠ Maintaining kitchen hearths; ♠ Cooking food on woodfuel for the family, farm workers and social occasions; ♠ Processing food; ♠ Cleaning hearths; ♠ Attending to ash & soot. 	<ul style="list-style-type: none"> ♠ Assisting women occasionally in cooking.

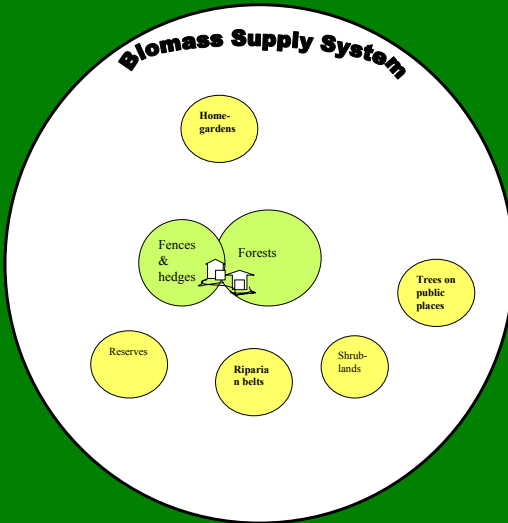
Aspects Used in Valuing Biomass Supply Sources

- Access;
- Rights to use sources;
- Nature/type of biomass needed & amount available;
- Time & energy required;
- Nature of work involved; and
- Ability to handle.

Relative importance of biomass supply sources for women in Hapuwala



Relative importance of sources for the poor



The resource transect of the supply sources

Sources	Homegarden	Fences & Hedges	Farmland	Forests + Shrubs	Riparian Systems	Public Places	Reservation
Type of Biomass	<ul style="list-style-type: none"> • Thinning – woody segments • Residues • Thinning 	<ul style="list-style-type: none"> • Pruning & coppicing • Woody segments 	<ul style="list-style-type: none"> • Agro-residues • Branch pruning of trees 	<ul style="list-style-type: none"> • Woody biomass • Sticks & dead wood 	<ul style="list-style-type: none"> • Bamboo • Palm leaves • Stalks 	<ul style="list-style-type: none"> • Branch wood 	<ul style="list-style-type: none"> • Wood residues
Issues	<ul style="list-style-type: none"> • Inadequate supply • Irregular supply • Limited harvest • Lack of control 	<ul style="list-style-type: none"> • Limited availability • Limited options • Lack of control 	<ul style="list-style-type: none"> • Seasonal supply • Lack of control • Limited harvest 	<ul style="list-style-type: none"> • Distance • Access • Lack of authority • Restricted use 	<ul style="list-style-type: none"> • Distance • Harvesting risks • Lack of authority • Restricted use 	<ul style="list-style-type: none"> • Limited & irregularity • Lack of authority 	<ul style="list-style-type: none"> • Distance • Lack of authority • Restricted use

Community-based Off-grid Dendro- energy Development in Wadagahakiwla

Ket Features:

- Project implemented in year 2004;
- Wadagahakiwla has no electricity;
- Primary livelihood is agriculture;
- Total population in 98 household is 472 (51.1% women & 48.9% men);
- 62% got permanent houses;
- 82% got more than 2 acres per family;
- 1980s commercial agriculture has expanded;
- 1980s land regularization;
- Present rubber, homegarden, paddy and chena;
- *Wadagahakiwla Dendro Power Electricity Consumer Society has been formed to manage the project.*

Energy use in the village by % of households

Energy type	Items	Service	% of households
Kerosene	Lamps	Lighting	96
Solar panels	Lamps	Lighting	04
Diesel	Motorcycle	Traveling	03
Battery	Radio	Leisure/information	88
Battery	TV	Leisure/information	76
Biomass	Hearths	Cooking	100
Charcoal	Iron	Ironing	64

Project Implementation

- Partnership between the society & Energy Forum;
- Membership is equally opened;
- Fee is Rs. 500/=, 250 as entry fee & 250 membership fee;
- Households are committed to contributed family labour on self-help basis;
- 250 kg of Nanchi (*Gliricidia*) provided by each households to start the project;
- Daily consumption is 40-60kg of feedstock;
- 60kg per month provided by a family;
- Price of *Gliricidia* is Rs. 200 per cubic metres.
- 19 member committee in-charge of 5-6 households;

Project Impact

- Social capital & community level focal point;
- Partnership between NGOs & dendro consumer society;
- Awareness & management skills;
- Equal opportunities for village households to get electricity through society;
- Local control over supply chain;
- Economic benefits for suppliers;
- Local capacity for management; and
- Cash crop integrated woodfuel planting.

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Chipping Wood Bio Mass







Gender specific impacts/implications of the project perceived by men and women

Aspect/category	Nature of benefit	% responded & endorsed	
		Men	Women
Energy services	<u>Lighting – from 5-7 in the evening</u>		
	• Increased efficiency in attending to domestic chores	21	96
	• Reduced risks of using kerosene lamps	100	100
	• Enhanced mobility inside the house	100	100
	• Psychological relaxation	39	88
	• Stimulating children for education	100	100
	• Reading/learning opportunities	82	61
	• Social interactions/work	86	41
	• Attending to production work (mat weaving etc.)	00	02
	• Reduce pressure on domestic chores	42	91
	<u>Accessing Media</u>		
	• Receiving information/news	63	63
	• Leisure	78	56
	<u>Household electrical appliances</u>		
	• Ironing	31	82
	• Boiling water	04	04
	<u>Cooking</u>		
	• Increased pressure on women's resources	00	12
• Provisions for using electricity in cooking	00	00	
• Enhanced efficiency	06	62	

Contd/.....

Social	<u>Building social capital/leadership</u>		
	•Community level organization for common goals	100	100
	•Equal opportunities for men & women	82	31
	•Building reciprocity	100	100
	•Building managerial skills	80	60
	•Equal opportunities for the villagers for improving quality of life	42	30
	•Leadership opportunities (offices)	66	33
	•Membership in energy focused organization	91	09
	•Organizing production as suppliers	100	81
	•Organizing transportation	08	00
	•Building cohesiveness	72	92
	•Technological know-how	26	00
	<u>Empowerment</u>		
	•Cash returns for family	82	82
	•Equal opportunities for the households	100	100
	•Democratic decisions on leadership/decision	42	63
	•Equal opportunities for men and women	60	20
	•Recognizing community decisions	74	85
	•Building competence	64	98
	<u>Economic benefits</u>		
	•Getting value for farm/household produced (Nanchi)	100	100
	•Getting employment opportunities	10	--
	•Potential for starting village/home-based industries	60	20
	•Farm intensification by growing more Nanchi	44	30
	•Farm intensification by adding pepper vine	56	60
	•Eliminating expenses on Kerosene	53	64
	•Getting income from Nanchi to cover energy cost	100	100
•More values for earning income	86	86	
Contd/...			

Environmental	•Maintaining smell free intra-household conditions	100	100
	•Avoiding kerosene smoke in household environment	100	100
	•Enhanced perennial vegetal cover	63	80
	•Potentials to enrich soil	90	90
	•Potentials to conserve water & reduce water scarcity	72	60
	•Reducing soil erosion	96	93

POLICY RECOMMENDATIONS

- Community partnership;
- Internalization;
- Gender sensitive policy;
- Gender integrated initiatives;
- Building social capital at community level;
- Gender integrated planning;
- Mobilization;
- Local organizations;
- Attention for cooking energy;
- Gender disaggregated information;
- Renewable energy policy;
- Economic advancement;
- Clean energy technology for domestic cooking;
- Energy enterprise and services;
- Integrated energy technology;
- Training; and
- Evaluation.

**Lets Grow
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Energy**



Re-Greening Sri Lanka



