COMPENDIUM OF ENERGY-RELATED TECHNOLOGIES

1988

NATURAL RESOURCES, ENERGY & SCIENCE AUTHORITY OF SRI LANKA

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Natural Resources, Energy & Science Authority of Sri Lanka
47/5, Maitland Place
Colombo 7.

October 1988

(Compiled for the Natural Resources, Energy & Science Authority of Sri Lanka. by M. Watson)

FOREWORD

In 1981 the Natural Resources, Energy and Science Authority (then known as the National Science Council) published a Compendium of Research and Development Projects in Sri Lanka on Energy-Related Problems. This was prepared for the guidance of planners and managers of research, and included ongoing projects as well as those planned to commence that year.

Since most of these projects would have since been completed and many could have resulted in the development of useful technologies, the NARESA Working Committee on Energy felt that these technologies should be made available in a documented form.

This Compendium of Energy-Related Technologies is a result of this initiative. It has been compiled from information supplied by institutions to whom questionnaires were sent. The questionnaires were so worded as to exclude technologies still in the experimental stages.

The main purpose of preparing this compendium is to make available the information on energy-related technologies to potential users such as technologists, small scale industrialists and entrepreneurs.

Director-General
Natural Resources, Energy & Science Authority
47/5, Maitland Place
Colombo 7.

October 1988

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1. **Subject Area** : Biogas

2. **Technology** : **Biogas production**

3. **Institution** : School of Agriculture, Angunakolapelessa

4. **Principal Investigator(s)** : Lecturer in Agricultural Engineering

5. **Current Status** : Developed & demonstrated

6. **Description** : The biogas unit is fabricated according to the Chinese design. Animal wastes (mainly cow dung) are mixed with water in the ratio 1:1 and the resulting slurry put into the digester to fill 3/4 of the volume. For continuous gas production the slurry should be added daily.

7. **Raw materials/amount used** : (For a unit of 10 m^3 capacity)
Bricks (1800), cement (500 kg), lime (50 kg), sand (1 cube), padalow cement (5 kg), 3/8" iron bars (4 m), 3/4" metal (50 kg), 6" PVC pipe (2 m), 1/2" PVC pipe (1/2 m)

8. **Other relevant information/ Publications** : ————————

9. **Contact person** : Mr. M. Wanniarachchi
Lecturer, Agricultural Engineering
School of Agriculture
Angunakolapelessa.

1. **Subject Area** : Biomass other than fuelwood
2. **Technology** : **Energy from combustion of paddy husk**
3. **Institution** : Dept. of Chemical Engineering, Univ. of Peradeniya
4. **Principal Investigator(s)** : Prof. W.J.N. Fernando, Mr. W.R.M.U. Wickramasinghe
5. **Current Status** : Developed & demonstrated theoretically
6. **Description** : Fluidised bed combustion of paddy husk is used in the generation of steam which is in-turn used for power generation.
7. **Raw materials/amount used** : Paddy husk 0.296 tonnes/h
8. **Other relevant information/ Publications** : Proc. Ann. Sessions SLAAS 1986, p. 96
9. **Contact person** : Prof. W.J.N. Fernando
Head, Dept. of Chemical Engineering
Univ. of Peradeniya
Peradeniya.

Tel: 08—88302, 08—88029

1. **Subject Area** : Biomass, other than fuelwood

2. **Technology** : **Husk fired furnace for grain drying**

3. **Institution** : Dept. of Agricultural Engineering, Univ. of Peradeniya and FAO

4. **Principal Investigator(s)** : Dr. S.G. Ilangantileke, Mr. D.R. Dharmasiri

5. **Current Status** : Developed & demonstrated

6. **Description** : The furnace consists of a used oil drum with compacted paddy husk leaving a centre passage for forced primary (fan) air entry. The secondary combustion takes place at the outlet of the drum. The fumes leaving the drum are mixed with regulated air to give the desired temperature for grain drying. The total quantity for batch feeding is 50 kg paddy husk which is sufficient to dry two tons of grain within 8 hours.

7. **Raw materials/amount used** :

Used oil drums	— 01
Paddy husk	— 50 kg
Metal sheet (G 28)	— 01
Round iron (1") bars	— 01
Pop rivets	— 25
Flat iron (1/2" x 1/2") bars	— 1/2

8. **Other relevant information/ Publications** : _____

9. **Contact person** : Dr. Ben Basnayake
Lecturer, Energy Technology
Dept. of Agric. Engineering
Faculty of Agriculture
Univ. of Peradeniya
Peradeniya.

Tel: 08—88301 ext. 320

1. **Subject Area** : Biomass, other than fuelwood

2. **Technology** : **Use of saw dust and agricultural waste in industries**

3. **Institution** : Industrial Development Board

4. **Principal Investigator(s)** : Mr. S.K. Rajapakse

5. **Current Status** : Developed, demonstrated & being commercialized

6. **Description** : A unit has been developed to heat air required for the drying processes. This is being fueled by sawdust, paddy husk or any other agricultural waste. Air is forced through a heat exchanger placed on a sawdust stove. It is now being introduced to processes which need dehumidified air.

7. **Raw materials/amount used** : Discarded diesel barrel – (for the stove)
1/4" & 1/8" thick M.S. sheets (about 4 sq. feet of each) and 2" G.I. piping. An electric blower is also being used for this unit.

8. **Other relevant information/ Publications** : Comparative cost (1987) to generate 650 MJ/day in the form of hot air:

Electricity	– Rs.385/=	Furnace oil	– Rs. 280/=
Fuelwood	– Rs.169/=	Sawdust air heater	–Rs. 80/=

9. **Contact person** : Mr. S.K. Rajapakse
Engineer – Energy Resources
I.D.B., 615, Galle Road
Katubedde
Moratuwa.

Tel: 505326, 505327, 505450

1. **Subject Area** : Biomass, other than fuelwood

2. **Technology** : **Utilization of paddy husk as fuel**

3. **Institution** : Ceylon Institute of Scientific and Industrial Research

4. **Principal Investigator(s)** : Dr. S.A. Abeysekera, Mr. P. Jayachandran, Mr. N. Sivakumaran, Mr. M.S. Mannapperuma, Miss. G.M.K.E. de Silva

5. **Current Status** : Developed and demonstrated

6. **Description** : Paddy husk has been used as fuel in cyclone burners, and the heat generated in this process utilized for heating ovens (bread baking) and boilers.

7. **Raw materials/amount used** : Fire bricks, bricks, ant hill clay, mild steel sheets and 'L' iron

8. **Other relevant information/ Publications** : The above technology is awaiting commercialization

9. **Contact person** : Dr. Tissa Habarakada
O.I.C., Pilot Plant & Designs
CISIR
363, Bauddhaloka Mawatha
Colombo 07.

Tel: 93807 — 09, 598620 — 24

1. **Subject Area**	:	Electricity for remote areas
2. **Technology**	:	**'Prashakthi' lighting system**
3. **Institution**	:	National Engineering Research and Development Centre of Sri Lanka
4. **Principal Investigator(s)**	:	Electronics Dept. of the Centre under the guidance of the Chairman Dr. A.N.S. Kulasinghe
5. **Current Status**	:	In full commercial use
6. **Description**	:	The Prashakthi light operates on a 12V battery. An oscillator circuit is used to generate the initial starting voltage. The unit has a 6W/20W fluorescent tube mounted on a ceiling/wall type housing and a high frequency drive source contained in the housing itself. It is ideal for lighting rural cottages.
7. **Raw materials/amount used**	:	Electronic components, fluorescent tubes, 12V storage battery.
8. **Other relevant information/ Publications**	:	Estimated 300,000 units have been sold through more than 50 licenced manufacturers.
9. **Contact person**	:	Mr. S.K.W. Fernando Head, Dept. of Techno Economics NERD Centre Ekala, Jaela. Tel: 536284, 536307, 536384

1. **Subject Area**	:	Energy conservation
2. **Technology**	:	**Energy Conservation by using recirculation techniques in the manufacture of desiccated coconut**
3. **Institution**	:	Dept. of Chemical Engineering, University of Peradeniya.
4. **Principal Investigator(s)**	:	Prof. W.J.N. Fernando, Mr. T. Thangavel
5. **Current Status**	:	Developed & demonstrated
6. **Description**	:	Heat recovery from flue gases and exhaust gases in desiccated coconut manufacture
7. **Raw materials/amount used**	:	Firewood, fuel oil
8. **Other relevant information/ Publications**	:	(a) Proc. Ann. Sessions SLAAS 1978, p. 34 (b) COCOS (J. of Coc. Res. Inst. Sri Lanka) 1984, 2, p. 18
9. **Contact person**	:	Prof. W.J.N. Fernando Head, Dept. of Chemical Engineering University of Peradeniya Peradeniya. Tel: 08—88302, 08—88029

1.	**Subject Area**	: Fuelwood & Charcoal
2.	**Technology**	**Fuelwood efficient stove for domestic use**
3.	**Institution**	: Ceylon Institute of Scientific and Industrial Research
4.	**Principal Investigator(s)**	: Dr. M.B. Herath
5.	**Current Status**	: Developed, demonstrated and being commercialized
6.	**Description**	: An improved firewood stove has been designed, constructed and tested for domestic use. The stove is constructed out of fired clay. It consists of a stove body, grate and ash collection pan. The stove can be fabricated by a pottery artisan.
7.	**Raw materials/amount used**	: Suitable clay for the construction of the stove
8.	**Other relevant information/ Publications**	: Commercialization is done by the National Fuelwood Conservation Programme, Ministry of Power & Energy
9.	**Contact person**	: Dr. M.B. Herath Officer-in-charge Wood & Cellulose Technology Section CISIR, 363, Bayddhaloka Mawatha Colombo 07. Tel: 93807 – 09, 598620 – 24

1. **Subject Area** : Fuelwood & Charcoal

2. **Technology** : **Fuelwood efficient stove for domestic use**

3. **Institution** : Industrial Development Board

4. **Principal Investigator(s)** : Mr. S.K. Rajapakse

5. **Current Status** : Developed, demonstrated and being commercialized

6. **Description** : A stove named "Sawood" — save wood has been developed for domestic use with the following features.
   1. Fuelwood saving
   2. Low cost
   3. Easy marketability and commercial production

   This stove is made of pottery clay or sheet metal. It provides sufficient primary and secondary air for combustion. Further, it provides an economical fire box space for better heat transfer.

7. **Raw materials/amount used** : Pottery stove uses pottery clay with ball clay and fine sand and two mild steel wires for safety. About 2 kg clay is being used for a stove. Sheet metal stove uses about 3 sq feet of mild steel sheets.

8. **Other relevant information/ Publications** : Selling price (1987) of a clay stove is 20/=. The clay stove has been found to save 25% of fuelwood compared to the traditional semi-enclosed fireplace. The metal stove is more durable but saves less fuelwood than the clay stove.

9. **Contact person** : Mr. S.K. Rajapakse
Engineer — Energy Resources
I.D.B., 615, Galle Road
Katubedde
Moratuwa.

Tel: 505326, 505327, 505450

1. **Subject Area**	:	Fuelwood & Charcoal
2. **Technology**	:	**Production of charcoal as a source of energy for cooking & barbecuing**
3. **Institution**	:	State Timber Corporation
4. **Principal Investigator(s)**	:	State Timber Corporation
5. **Current Status**	:	In full commercial use
6. **Description**	:	The State Timber Corporation started carbonising charcoal from firewood and wood residues such as branchwood, slash produced from Mahaweli Accelerated Development areas. Charcoal is burnt using (1) Steel Kilns (2) Pit Kilns. The first method of burning charcoal is more efficient in that the out-turn is more and quality of charcoal is better. Charcoal was introduced as a source of energy for domestic cooking and barbecuing to the Sri Lanka housewife along with a clay cooker (Ref. page 1). Charcoal was introduced to the market in 3kg domestic packs with the trade name 'Timco'. At present the Timco charcoal & clay cooker are popular among urban housewives.
7. **Raw materials/amount used**	:	Charcoal is converted from firewood, branchwood & waste timber
8. **Other relevant information/ Publications**	:	Timco charcoal can be used for cooking and barbecuing. Production of charcoal commenced in 1979 and the average annual domestic sales is 600 tonnes. Exports annually is 1500—2000 tonnes.
9. **Contact person**	:	Mr. N.B. Embogama Manager (Special Projects) State Timber Corporation 246, Galle Road Colombo 06. Tel: 588766

1. **Subject Area** : Fuelwood & Charcoal

2. **Technology** : **Wood charcoal stove for domestic use**

3. **Institution** : Ceylon Institute of Scientific and Industrial Research

4. **Principal Investigator(s)** : Dr. Dhammika de Silva

5. **Current Status** : In full commercial use

6. **Description** : A wood charcoal stove has been designed, developed, constructed and tested for domestic cooking. The stove is out of fired clay and can be fabricated by a pottery artisan. It consists of a cylindrical stove body, grate and ash collecting tray. The fuel that is used is wood charcoal manufactured out of timber waste.

7. **Raw materials/amount used** : Clay

8. **Other relevant information/ Publications** : The stove and bagged charcoal are marketed by STC (State Timber Corporation) and are available in the market.

9. **Contact person** : Dr. M.B. Herath
O.I.C.
Wood & Cellulose Technology Section
CISIR, 363, Bauddhaloka Mawatha
Colombo 07.

Tel: 93807 — 09, 598620 — 24

1. **Subject Area**	:	Gasification
2. **Technology**	:	**Gasifier operated dryers**
3. **Institution**	:	National Engineering Research and Development Centre of Sri Lanka
4. **Principal Investigator(s)**	:	Alternative fuels dept. of the Centre under guidance of Chairman Dr. A.N.S. Kulasinghe
5. **Current Status**	:	Developed, demonstrated and being commercialized
6. **Description**	:	Gasifiers using fuelwood as fuel are being employed to generate heat for crops and process drying purposes
7. **Raw materials/amount used**	:	M.S. Sheets, Galvanised piping
8. **Other relevant information/ Publications**	:	————
9. **Contact person**	:	Mr. S.K.W. Fernando Head, Dept. of Techno Economics NERD Centre Ekala, Jaela. Tel: 536284, 536307, 536384

1. **Subject Area**	:	Gasification
2. **Technology**	:	**Gasifier operated foundry**
3. **Institution**	:	National Engineering Research and Development Centre of Sri Lanka
4. **Principal Investigator(s)**	:	Alternative fuels dept. of the centre under guidance of Chairman Dr. A.N.S. Kulasinghe
5. **Current Status**	:	Developed, demonstrated and being commercialized
6. **Description**	:	A method to use wood gasifiers for melting non ferrous alloys for foundry work has been developed. This method provides an economical alternative to conventional metal melting processes, and replaces fuels such as furnace oil, coconut charcoal and kerosene with firewood.
7. **Raw materials/amount used**	:	M.S. Sheets, Galvanised piping, Fire bricks
8. **Other relevant information/ Publications**	:	————
9. **Contact person**	:	Mr. S.K.W. Fernando Head, Dept. of Techno Econonics NERD Centre Ekala, Jaela. Tel: 536284, 536307, 536384

1. **Subject Area** : New energy resources

2. **Technology** : **Conversion of natural rubber to motor fuels**

3. **Institution** : University of Ruhuna

4. **Principal Investigator(s)** : Prof. R.H. Wijayanayake

5. **Current Status** : Developed, demonstrated but needs further development

6. **Description** : RSS rubber on treatment with a catalyst at a temperature about 200^{o}C yields petroleum like fuel
1kg of rubber yields 1 litre of fuel

7. **Raw materials/amount used** : Natural rubber

8. **Other relevant information/ Publications** : ————

9. **Contact person** : Prof. R.H. Wijayanayake
Prof. of Chemistry
Dept. of Chemistry
Univ. of Ruhuna
Matara.

Tel: 041—2681

1. **Subject Area** : Solar power

2. **Technology** : **Solar drying**

3. **Institution** : Industrial Development Board

4. **Principal Investigator(s)** : Mr. H.C.S. Peiris, Mr. W. Jeganathan

5. **Current Status** : In full commercial use

6. **Description** : The Solar dryer comprises of three main parts —
   (a) Two collectors with blackened corrugated sheets and blackened metal shavings, arranged in a slanting manner
   (b) Central drying chamber — quadrangular in shape with tapering top end. Transparent sheets on 3 sides facing solar rays, with the rear side blackened
   (c) Wind-powered rotary vane suction to facilitate removal of moisture.

7. **Raw materials/amount used** : Timber — 2" x 2" Class 1 — 150 ft.
   1/2" planks — 24 sq. ft.
   Glass — 60 sq. ft.
   Corrugated sheets (blackened)
   Metal shavings

8. **Other relevant information/ Publications** : Small scale solar units based on this design are in use, specially for drying stringhoppers.

9. **Contact person** : Mr. H.C.S. Peiris
   Director/Technical Services
   I.D.B.
   615, Galle Road
   Katubedde.

   Tel: 505278

1. **Subject Area** : Solar power

2. **Technology** : **Solar dryer**

3. **Institution** : Ceylon Institute of Scientific and Industrial Research

4. **Principal Investigator(s)** : Dr. S. A. Abeysekera

5. **Current Status** : Developed & demonstrated

6. **Description** : The solar dryer designed and fabricated at the CISIR has an inclined cabinet with glass cover. The area of the cabinet is $2-3m^2$ and made out of wood and glass. This is capable of drying vegetables, crops and a wide variety of material. The capacity depends on the weather, type of material and also its initial moisture content.

   The cost would be around Rs. 1500/=.

7. **Raw materials/amount used** : Wood, wiremesh, glass, metal sheets and paint

8. **Other relevant information/ Publications** : A solar cabinet dryer is being used by the Food Technology Section of the CISIR for dehydration of fruits and vegetables. It has also been demonstrated and is being used at Waguruwela.

9. **Contact person** : Dr. Tissa Habarakada
   OIC, Pilot Plant & Designs
   CISIR
   363, Bauddhaloka Mawatha, Colombo 7.

   Tel: 93807—9, 598620—24

1. **Subject Area** : Solar power

2. **Technology** : **Solar dryer for minor export crops processing**

3. **Institution** : Dept. of Agricultural Engineering, University of Peradeniya, and Dept. of Minor Export Crops

4. **Principal Investigator(s)** : Dr. S. G. Ilangantileke, Mr. Dias Gunasinghe

5. **Current Status** : Developed & demonstrated

6. **Description** : Low cost solar flat plate collector is used to heat air ventilated through a wind turbine located above the drying chamber. The rate of air flow is a function of wind velocity, the level of radiation, and chimney effect.

7. **Raw materials/amount used** :

Chip boards	3' x 6'	— 3 sheets
Glass sheets	2.5' x 6'	— 1
Wire mesh	3' x 9'	— 1
Aluminium sheet	2' x 2'	— 1

8. **Other relevant information/ Publications** : Minor export crops require drying to prevent quality deterioration which occurs due to extraneous materials and bleaching when the produce is dried in open air.

9. **Contact person** :

Dr. Ben Basnayake
Lecturer/Energy Technology
Dept. of Agric Engineering
Faculty of Agriculture
Univ. of Peradeniya, Peradeniya.

Tel: 08—88301 ext. 320

1. **Subject Area** : Solar Power

2. **Technology** : **Use of solar energy for drying of natural rubber**

3. **Institution** : Rubber Research Institute

4. **Principal Investigator(s)** : Mr. S.W. Karunaratne, Mr. M.C.S. Perera, Mr. S. Weerasinghe

5. **Current Status** : Being developed

6. **Description** : Use of solar collectors and transfer of hot air through a suitable storage system to a drying tower suitably modified to prevent heat losses.

7. **Raw materials/amount used** : Natural rubber

8. **Other relevant information/ Publications** : ———

9. **Contact person** : Mr. S.W. Karunaratne
Deputy Director (Research)
R.R.I.
Agalawatta.

Tel: 715851, 034—71470

1. **Subject Area** : Solar power

2. **Technology** : **Solar steam cooker**

3. **Institution** : Ceylon Institute of Scientific and Industrial Research

4. **Principal Investigator(s)** : Dr. S. A. Abeysekera

5. **Current Status** : Developed & demonstrated

6. **Description** : The unit which was fabricated at the CISIR is the detached collector and cooking chamber type. The collector is made out of copper sheet and tubes and the cooking chamber is of mild steel sheet.
This unit is capable of cooking about 750 g rice, 500 g of a vegetable and 500 g of fish or meat curry between 9.30 a.m. and 1.30 p.m. on a very good sunny day.
The cost of the cooker is around Rs. 3,000/=.

7. **Raw materials/amount used** : Copper sheets, copper tubes, glass wool, wood, 'L' iron and piping

8. **Other relevant information/ Publications** : ————————

9. **Contact person** : Dr. Tissa Habarakada
OIC, Pilot Plant & Designs
CISIR
363, Bauddhaloka Mawatha, Colombo 7.

Tel: 93807—9, 598620—24

1. **Subject Area** : Solar power

2. **Technology** : **Solar water heater**

3. **Institution** : Ceylon Institute of Scientific and Industrial Research

4. **Principal Investigator(s)** : Dr. S. A. Abeysekera

5. **Current Status** : Developed & demonstrated

6. **Description** : The unit designed and fabricated at the CISIR is capable of producing 200 litres of hot water per day at 55—60°C. It contains 02 flat plate collectors of 1.5m^2 area each and a storage tank of 250 litres capacity. The system works on the principle of thermosyphon flow which eliminates the involvement of moving parts to pump the water through the collectors.
   The collectors are made out of copper tubes and sheet and the storage tank is of fibre glass insulated with rigifoam. The cost of this unit is around Rs. 20,000/=.

7. **Raw materials/amount used** : Copper sheets, copper tubes, glass wool, fibre glass, glass sheets and necessary piping.

8. **Other relevant information/ Publications** : A water heater 'CISIRHEAT' was exhibited at exhibitions and seminars. The design is being utilized by several clients.

9. **Contact person** : Dr. Tissa Habarakada
   OIC, Pilot Plant & Designs
   CISIR
   363, Bauddhaloka Mawatha, Colombo 7.

   Tel: 93807—9, 598620—24

1. **Subject Area** : Solar power

2. **Technology** : **Solar water heater (solar therm)**

3. **Institution** : National Engineering Research and Development Centre of Sri Lanka

4. **Principal Investigator(s)** : Solar Energy Department of the Centre under the guidance of the Chairman Dr. A.N.S. Kulasinghe

5. **Current Status** : In full commercial use

6. **Description** : A flat bed type solar water heater has been designed using locally available materials. This can be manufactured in a small workshop with basic engineering facilities and has been designed for fabrication using carefully selected non-corrosive materials to withstand local conditions.

7. **Raw materials/amount used** : Copper sheets, aluminium sheets, fibre glass materials and piping

8. **Other relevant information/ Publications** : Products are being sold under the trade mark "Solar Therm" by a licencee appointed by the Centre.

9. **Contact person** : Mr. S.K.W. Fernando
Head, Dept. of Techno Economics
NERD Centre
Ekala, Jaela.

Tel: 536284, 536307, 536384

1. **Subject Area** : Solar power

2. **Technology** : **Solar water still**

3. **Institution** : Ceylon Institute of Scientific and Industrial Research

4. **Principal Investigator(s)** : Dr. S. A. Abeysekera

5. **Current Status** : Developed & demonstrated

6. **Description** : This is used to produce potable water for domestic use from salt or brackish water. It contains a basin painted black to hold the salt or the brackish water and a glass roof to perform the distillation and is capable of producing about one gal. of water/m^2 of still area per day on a good sunny day. The basin can be constructed with metal, plastic, fibre glass or cement and the cost would be around Rs. 1,500/=.

7. **Raw materials/amount used** : Rubber coated cemented basin, wooden frame, glass

8. **Other relevant information/ Publications** : A Solar water still has been installed at a Sarvodaya Community Centre at Punkudutivu, Jaffna.

9. **Contact person** : Dr. Tissa Habarakada
OIC, Pilot Plant & Designs
CISIR
363, Bauddhaloka Mawatha, Colombo 7.

Tel: 93807—9, 598620—24

1. **Subject Area** : Wind

2. **Technology** : **Wind pump**

3. **Institution** : Water Resources Board

4. **Principal Investigator(s)** : Mr. K. S. Fernando

5. **Current Status** : Developed & demonstrated

6. **Description** : Wind pump consists of a 3 m diameter six-bladed (steel) rotor, mounted on a 9 m high steel latticed tower, and is coupled to a surface mounted reciprocating pump. As the wind speed increases beyond about 4—5 m/s a system of vanes moves the rotor gradually out of the wind direction and controls the speed. A pump caters to the irrigation needs of about 0.6 ha of highland crops during the May — October period, in areas where the mean seasonal wind speed is about 4 m/s

7. **Raw materials/amount used** :

Mild steel angles, flats G.I. pipes and sheets Steel shafts, plates Nuts and bolts	Approx. 430 kg

8. **Other relevant information/ Publications** : The technology has been commercialized on a very limited scale. Field experience indicates the need to redesign the machine for improved reliability, and this is now being done by the Ceylon Electricity Board.

9. **Contact person** :

Mr. K.S. Fernando*
Project Engineer (Wind Energy)
Energy Unit
Ceylon Electricity Board
P. O. Box 540, Colombo.

Tel: 28801, 24471 ext. 360

*This technology was developed when Mr. Fernando was attached to the Water Resources Board.

APPENDIX 1

Questionnaire Sent to Institutions

Please use a separate sheet for each technology

1. Technology :—

2. Brief technical description of the technology :—

3. Principal investigator(s) :—

4. Institution responsible for the development :—

5. Information on raw materials and amounts :—

6. Current situation regarding the use of the technology :—
   (Please tick off appropriate box)

   ☐ developed & demonstrated

   ☐ developed, demonstrated & being commercialized

   ☐ in full commercial use

7. Any other relevant information :—

8. Contact person for further details :—

   Name : .....

   Designation : .....

   Telephone No : .....

   Address : .....

   .....