BIOMASS - THE MOST POTENT ENERGY SOURCE FOR RURAL INDIA

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Biomass provides opportunity to diversify into decentralised energy supplies. The outstanding advantages of biomass among the solar sources of energy is its built-in storage, in sharp contrast to many other forms of utilizing solar energy. Another advantage with this energy source is that the biomass is a renewable resource and as the resource is renewed the carbon emitted to the atmosphere is recaptured. Thus in contrast to fossil fuels it does not have adverse impact on global carbon balance. Increased availability of biomass will reduce the pressure on natural vegetation due to collection of firewood and thus would help avoid desertification, flooding and a host of other environmental and socio-economic problems. About 15 percent of total energy used world wide comes from biomass which is as much as 43 percent for developing countries.

Biomass is the predominant source of energy in rural India. Upto 95 percent of the rural household energy comes from biomass, directly or indirectly. Most of this is met through non-commercial sources comprising firewood, animal dung, agro-residue or agro-industrial wastes. More than 85 percent of the non-commercial sources of energy are derived from firewood. According to India's UNCED submission (1992) 162 million air dried tonnes of fuelwood is consumed per annum and only one-fourth of which comes from sustainable cut. Accordisng to 1982 Fuelwood Study Committee Report, the annual demand and availability of fuelwood is 166 and 28 million tonnes per annum respectively which was 132 and 49 million tonnes per annum in 1975. Thus in the year 1982 there was a net deficit of 138 million tonnes per annum. The rural poor and women are the worst sufferers of the energy crisis.

This deficit in demand and supply is largely met through gathering, and unsustainable cut, and encourages illegal extractions from protected and reserved forests, national parks, sanctuaries, causes depletion of village safety forests, depletion of bio-diversity and also gives rise to social

conflicts of various kinds. In many forest communities, commercial fuelwood headloading represents an important source of cash for low income families especially for the poorest of the poor. Commercial headloading is a major cause of forest disturbance. These headloaders often overutilize these resources until they are exhausted. Such over exploitation of resources have been noticed in several parts of our country especially in arid and semi-arid regions. This poverty related over exploitation of life support base initiates a vicious circle between poverty and environment.

The solution to the rural energy crisis lies in how soon we can develop/standardize the technologies for short rotation energy plantations and how soon the available technologies can be transferred to the users. With the present level of technology also it is possible to harvest as much as 200 tonnes of wood/ha. after 4 years. This means energy plantation on 3-4 m.ha. land will be enough to fulfil the fuelwood requirement of the country. This proposition is easily possible in a country where more than 75 m.ha. land is under the control of government. Technologies also need to be developed and popularized to increase the efficiency of conversion of wood into usable form of energy as at present 25 to 50 percent of fuelwood energy goes waste due to inefficient combustion and production of charcoal. The main thrust, therefore, has to be on improvement and transfer of technology. Sustainable biomass system, thus developed has to be a closed loop system where the nutrients and waste products generated by the energy conversion system are cycled back to the land.

Scientific management of land and water resources based on ecological principles and with community participation is another pre-requisite for sustainable yield of biomass energy in rural India. Several success stories of community management of resources are available in the states of Haryana, West Bengal Gujarat and Orissa. Development and success of sustainable biomass system will heavily depend on the joint effort of scientists, technocrats, extension specialists, resource managers and on the level of people's participation. There is every reason to believe that such effort will, within a reasonable period of time, make the rural households self-sufficient in their energy requirements for cooking, heating and for small and cottage industries. Increased availability of energy will help

protection of environment, conservation of natural resources and in turn improve the lividng standard of the rural people, on a sustainable basis. Research data have amply demonstrated that the biomass production potential on land not required for food production is sufficient to allow the biomass continue to supply energy requirements of the rural India on a most environment friendly and sustainable basis. And if suitable cost effective technologies are developed biomass has all potentials to replace fossil energy as a primary energy source in developed countries as well.

ECOLOGICAL CAPITAL

1. Top soil
2. Old Growth Forest
3. Ground Water
4. Pure Air
5. Biodiversity
6. Fossil Fuels
7. Minerals and Metal Deposits

Once ecological capital is exhausted the society responsible will perish.

SAVE ECOLOGICAL CAPITAL AVOID ECOSYSTEM COLLAPSE !!!

FUELWOOD-ENVIRONMENT-POVERTY LINKAGE

Collection of Wood for Fuelwood, Headload, etc.

LESS VEGETATION

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LESS RAIN THAT IS TRAPPED

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LESS REGENERATION

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MORE EROSION

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People must walk further for Fuelwood etc. more effort to put into search for Fuelwood, etc.

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LESS ENERGY THEY HAVE TO DO ANYTHING

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LESS INCOME

ANNEXURE - IV

BIOMAS YIELD OF SELECTED PLANT SPECIES IN INDIA

Name of species	Age Years	Total Yield (T/ha.)	Yield (T/ha./Yr.)	Source
Cassia siamea	3.5	59.23	16.92	RPRC, Bhubaneswar
Leucaena leucocephala	3.5	39.49	11.28	- do -
Casurina equisetifolia	3.5	22.08	6.30	- do -
Acacia auriculiformis	3.5	37.70	10.77	- do -
Gliricidia sepium	3.5	25.13	7.18	- do -
Prunus cerasoides	7	126.04	18.04	Srinagar (U.P.)
Alnus nepalensis	5	70.00	14.04	- do -
Albizia stipulata	6	120.00	20.00	- do -
Leucaena leucocephala (KB)	3	110.40	36.80	MKU Madurai
Albizia lebbek	3	60.00	20.00	- do -
Hardwickia binnata	3	100.50	33.50	- do -
Samania saman	5	80.10	26.70	- do -
Cassia siamea	3	62.10	20.70	- do -
Erythrina indica	3	79.80	26.60	- do -
Prosopis juliflora	8	96.49	12.00	NBRI, Lucknow
Terminalia arjuna	6	42.00	7.00	- do -
Acacia nilotica	8	59.50	7.43	- do -
Acacia auriculiformis	8	54.54	6.82	- do -
Prosopis juliflora	8.5	187.00	22.00	NARI, Phaltan

SOME ADVANTAGES AND PROBLEMS IN BIOMASS FOR ENERGY

1. STORES ENERGY	1. LAND & WATER USE COMPETITION
2. RENEWABLE	2. BULKY RESOURCE TRANSPORT AND STORAGE CAN BE A PROBLEM
3. TECHNOLOGY AVAILABLE	3. SUBJECT TO CLIMATIC VARIABILITY
4. MINIMUM CAPITAL INPUT	4. LOW CONVERSION EFFICIENCY
5. AVAILABLE TO ALL INCOME GROUPS	5. SEASONAL
6. CREATE EMPLOYMENT	6. LABOUR INTENSIVE
7. ECOLOGICALLY IN-OFFENSIVE AND SAFE	7. FERTILIZER, REQUIREMENTS
8. DOES NOT INCREASE ATMOSPHERIC CO_2	

RESEARCH NEEDS

1. Land Availability Survey
2. Site Evaluation
3. Species and Site Matching
4. Seed and other Planting Material
5. Improvement in Planting Practices
6. Productivity
7. Fertilizer & Nutrient Removal
8. Forestry System
9. Weed control
10. Breeding & Provenance Selection
11. Management and Economics
12. Pathology & Disease Control
13. Informatics
14. Analysis of Natural Vegetation
15. Organismal Interactions