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Biomass Energy and Rural Development

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Biomass energy systems not only offer significant possibilities for clean energy production and agricultural waste management but also foster sustainable development in rural areas. The increased utilization of biomass wastes will be instrumental in safeguarding the environment, generation of new job opportunities, sustainable development and health improvements in rural areas.

Modernization of Agricultural Economy : Biomass energy has the potential to modernize the agricultural economy. The development of efficient biomass handling technology, improvement of agro-forestry systems and establishment of small, medium and large-scale biomass-based power plants can play a major role in rural development.

Sustainable harvesting practices remove only a small portion of branches and tops leaving sufficient biomass to conserve organic matter and nutrients. Moreover, the ash obtained after combustion of biomass compensates for nutrient losses by fertilizing the soil periodically in natural forests as well as fields.

Planting of energy crops on abandoned agricultural lands will lead to an increase in species diversity. The creation of structurally and species diverse forests helps in reducing the impacts of insects, diseases and weeds. Similarly, the artificial creation of diversity is essential when genetically modified or genetically identical species are being planted.

Agricultural Waste as a Treasure : Improvements in agricultural practices promises to increased biomass yields, reductions in cultivation costs, and improved environmental quality. Extensive research in the fields of plant genetics, analytical techniques, remote sensing and geographic information systems (GIS) will immensely help in increasing the energy potential of biomass feedstock.

Rural areas are the preferred hunting ground for the development of biomass sector worldwide. By making use of various biological and thermal processes (anaerobic digestion, combustion, gasification, pyrolysis), agricultural wastes can be converted into biofuels, heat or electricity, and thus catalyzing sustainable development of rural areas economically, socially and environmentally.

A large amount of energy is utilized in the cultivation and processing of crops like sugarcane, wheat and rice which can met by utilizing energy-rich residues for electricity production. The integration of biomass-fueled gasifiers in coal-fired power stations would be advantageous in terms of improved flexibility in response to fluctuations in biomass availability and lower investment costs.

There are many areas in India where people still lack access to electricity and thus face enormous hardship in day-to-day lives. Biomass energy promises to reduce 'fuel poverty' commonly prevalent among remote and isolated communities. Obviously, when a remote area is able to access reliable and cheap energy, it will lead to economic development and youth empowerment.

Anaerobic Digestion and Rural Development : Anaerobic digestion proves to be a beneficial technology in various spheres. Biogas produced is a green replacement of unprocessed fuels (like fuel wood, dung cakes, crop residues). It is a cost effective replacement for dung cakes and conventional domestic fuels like LPG or kerosene. Biogas technology has the potential to meet the energy requirements in rural areas, and also counter the effects of reckless burning of biomass resources.

An additional benefit is that the quantity of digested slurry is the same as that of the feedstock fed in a biogas plant. This slurry can be dried and sold as high-quality compost. The nitrogen-rich compost indirectly reduces the costs associated with use of fertilizers. It enriches the soil, improves its porosity, buffering capacity and ion exchange capacity and prevents nutrient depletion thus improving the crop quality. This means increased income for the farmer.

Further, being relatively-clean cooking fuel; biogas reduces the health risks associated with conventional chulhas. Thinking regionally, decreased residue burning brings down the seasonal high pollutant levels in air, ensuring a better environmental quality. Anaerobic digestion thus proves to be more efficient in utilization of crop residues. The social benefits associated with anaerobic digestion (also known as biomethanation), along with its capacity to generate income for the rural households make it a viable alternative for conventional methods.

Clean Cookstoves - An Urgent Necessity for Rural Population : Globally, three billion people in the developing nations are solely dependent on burning firewood, crop residues, animal manure etc. for preparing their daily meals on open fires, mud or clay stoves or simply on three rocks strategically placed to balance a cooking vessel. The temperature of these fires is lower and produce inefficient burning that results in black carbon and other short-lived but high impact pollutants.

These short-lived pollutants not only affect the persons in the immediate area but also contribute much harmful gases more potent than carbon dioxide and methane. For the people in the immediate area, their health is severely hampered as this indoor or domestic air pollution results in significantly higher risks of pneumonia and chronic bronchitis.

To remedy the indoor air pollution and health-related issues as well as the environmental pollution in the developing world, biomassbased clean cookstoves are an urgent necessity for rural population. If the cookstove unit is powered by simple biomass-based system, this will change the whole nature of the lifestyle and domestic duties of the chief cook and the young siblings who are typically charged with collecting the natural firewood to meet the cooking requirement. Therefore, the cookstoves need to be designed and adapted for the people group and their traditional cooking habits and not in the reverse order.