

RENEWABLE ENERGY TECHNOLOGIES-BENEFITS, OPPORTUNITIES AND CONSTRAINTS

1.0 Benefits

1.1 Renewable energy technologies can Supply Cooking and Heating Fuel, saving Time and Income

In Nepal, the Biogas Support Programme, a Clean Development Mechanism project Under the Kyoto Protocol, proposes to supply 200,000 new biogas plants by 2009. A typical digester of 6–8 cubic meters in size produces 300 cubic meters of biogas a year and, if manufactured domestically, costs \$200–250 and pays for itself over time. These units can be supplied by local companies, as digesters are a simple technology with no need for advanced expertise. After receiving training, farmers can build the digesters themselves.

Moreover, in addition to providing energy for cooking and heating, the systems can be potentially combined with a generator that produces electricity and motive power. (REN21 Renewable Energy Policy Network. 2005)

Biofuels are renewable and can be produced locally in most African countries. A 2003 study found that improvements in combustion, end-use efficiency, and production had resulted in a more than 50-percent reduction in the cost of gel fuel. Private gel fuel plants now operate in South Africa (with a production capacity of 200,000 liters/month), Zimbabwe (20,000 liters/month), and Malawi (25,000 liters/month). With the recent development of new low-cost (US \$15) direct-ethanol stoves, cooking with bio fuel will lower the expense of cooking even more, making direct ethanol competitive even with fuel wood and charcoal. (REN21 Renewable Energy Policy Network. 2005)

1.2 RETs Can Provide Lighting, Communications, Refrigeration, and Conveniences

Electricity can contribute directly to poverty reduction by amplifying human capacity, that is, by making it possible to engage in commercial activity and reducing unit costs. Indirect contributions to poverty alleviation may come in the form of free time for other productive activities, improved health and education, improved access to and supply of clean water, and reduced local environmental degradation.

In contrast, RETs such as solar photovoltaic (PV), biogas digesters, small wind-electric turbines, and micro-hydro systems are often ideal for providing electricity in rural areas, ranging from a few watts to thousands of watts, at a lower life-cycle cost than conventional alternatives such as dry cell batteries and which can utilize portions of the very distribution networks that are now used to distribute kerosene and LPG. In Mali, for example, oil from the seeds of *Jatropha* bushes can be used for cooking, lighting, and running engines (REN21 Renewable Energy Policy Network. 2005)

The commercial sale of PV in Kenya, without explicit development assistance, is an example of successful large-scale dissemination of solar power.

1.3 Renewable Energy Technologies Can Create Opportunities for Income Generation

Communities can select and combine the least-expensive mix of technologies, this permits the best and most cost-effective solutions, given local circumstances. They do this by spurring the creation of micro-enterprises (MEs), stimulating income directly by engaging people in using local resources and selling energy services, as well as indirectly through gains in productivity or expanded economic activity resulting from new energy inputs. (REN21 Renewable Energy Policy Network. 2005)

The productive uses of energy that contribute most to economic development are associated with agriculture, as process heat and motive power is found to be more crucial to income-generation than lighting. By enabling food preservation (e.g., drying, smoking, chilling, and freezing). Renewable Energy Technologies enabled preservation also creates the ability to store goods for later sale during different seasons, resulting in better income distribution over time.

In India, the Punjab Renewable Energy Development Agency (PEDA), with support from manufacturers and financiers, installed 100 solar PV systems to provide a continuous supply of water for agriculture.

Thailand produces 9.6 thousand tons of bananas for drying each year. Banana chips processed by a solar dryer sell for 15.08 Baht (US \$0.36) per kilogram, while chips dried conventionally (over fire or on shelves in the sun vulnerable to insects) go for only 8.62 Baht (US \$0.21) per kilogram. The increased income from drying all bananas with solar technology is \$1.5 million per year. important part of the economic activity in developing countries. (REN21 Renewable Energy Policy Network. 2005)

1.4 Opportunities

There is no shortage of solar-derived energy on Earth. Indeed the storages and flows of energy on the planet are very large relative to human needs. Annual photosynthesis by the vegetation in the United States is 50 billion GJ, equivalent to nearly 60% of the nation's annual fossil fuel use. The amount of solar energy intercepted by the Earth every minute is greater than the amount of energy the world uses in fossil fuels each year. The energy in the winds that blow across the United States each year could produce more than 16 billion GJ of electricity—more than one and one-half times the electricity consumed in the United States in 2000. Tropical oceans absorb 560 trillion gigajoules (GJ) of solar energy each year, equivalent to 1,600 times the world's annual energy use.

Transmission of energy on a smaller scale, use of renewable energy produced on site reduces burdens on electricity distribution systems and is more efficient to be used for a

few hours of the week. Biogas has advantages over other technologies because it has the added benefit of producing a soil amendment that can boost agriculture productivity. (REN21 Renewable Energy Policy Network. 2005)

The ethanol and bio diesel production industries also create jobs in plant construction, operations, and maintenance, mostly in rural communities. Increased income from biofuels could also provide the economic incentives for farmers to invest in more efficient agricultural production methods. (GTZ/Kenya Ministry of Agriculture, 2008) In addition to their environmental sustainability and low- to non-existent emissions, Renewable Energy Technologies can create new economic opportunities and can be locally produced.

While grid-connected renewable energy technologies can have a larger impact on national energy portfolios and the macroeconomic health of a country, decentralized off-grid Renewable Energy Technologies increasingly contribute to community-level energy development, particularly in rural areas, and should be recognized for their potential contribution to achieving the MDGs. (REN21 Renewable Energy Policy Network. 2005)

A wind farm, when installed on agricultural land, has one of the lowest environmental impacts of all energy sources: It occupies less land area per kilowatt-hour (kWh) of electricity generated than any other energy conversion system and is compatible with farming. It is convenient as its construction takes just 3 months yet its operational lifetime is 20–25 years.

There are no greenhouse gas emissions or air pollution produced by its operation.

Hydroelectric systems eliminate the cost of fuel. have low operating costs, and the provision of facilities for water sports.

Solar and wave energy are readily available and reliable. There is no shortage of solar-derived energy on Earth, it is negligible and inexhaustible. Wave energy and some other renewables are continuously available. A wave energy scheme installed in Australia generates electricity with an 80% availability factor. (www.wikipedia.org)

Biofuels and wind power in particular could provide a new source of business for farmers and agricultural processors, creating economic opportunities and jobs in rural areas that have suffered decades of falling crop prices. (REN21 Renewable Energy Policy Network. 2005)

There is a better chance of producing biofuels from sweet sorghum; sugarcane and castor since this feedstock s are less controversial in the food/fuel debate. They can be used a food and the by –products used in producing biofuels thus there are benefits for all. (Daily Nation April 14, 2009)

Marginal land that is unsuitable for most cultivation can be planted with faster-growing cellulose energy crops that are less resource intensive, are relatively drought resistant,

and require less maintenance. Biofuels offer an excellent platform to simultaneously advance various MDG objectives and contribute to rural development through the establishment of new crop plantations, distilleries, and other agro-industrial facilities, resulting in new agricultural and agro-industrial jobs and in new products with guaranteed market absorption (e.g. fertilizers, animal feed). (REN21 Renewable Energy Policy Network. 2005)

1.5 Constraints

Renewable energy technologies face a number of barriers that have delayed scaling-up their production and use in developing countries. Unlike conventional energy sources, which have benefited from decades of research and development, an established industrial base, and government-subsidized infrastructure support, renewable energy options are just becoming known in many regions.

Government policies and support systems are frequently biased in favour of conventional energy sources. New policies can have a dramatic impact on the pace of introduction of renewable energy, as several developing countries have demonstrated. (REN21 Renewable Energy Policy Network. 2005)

Because the ability of the rural poor to pay is low and because long-term, off-grid service costs are not known, market entry in rural off-grid markets was, and is still, considered a high-risk, low-return proposition. Financing rural renewable energy is particularly daunting, as credit is often unavailable and transaction costs are high, and demand is highly dispersed. The up-front costs of equipment and installation, not to mention ongoing maintenance costs, are not affordable for many rural residents without long-term financing options, while banks and other financial institutions are often reluctant to lend to consumers and entrepreneurs for RET systems.” (REN21 Renewable Energy Policy Network. 2005)

Much current discussion on renewable energy focuses on the generation of electrical energy thus little interest in generation of other forms of energy, despite the fact that many colder countries consume more energy for heating than as electricity. Critics suggest that some renewable energy applications may create pollution, be dangerous, take up large amounts of land, or be incapable of generating a large net amount of energy.

By contrast, the market for renewable heat is mostly inaccessible to domestic consumers due to inconvenience of supply, and high capital costs.

The UN Food and Agriculture Organization have raised more scientifically based concerns that current biofuels boom may be threatening a hungrier world over a long term. There is debate on whether domestic biofuels productions are sufficient to meet demanded for food and animal feed. (GTZ/Kenya Ministry of Agriculture, 2008)

Hydroelectric dams lead to shifting of riverbeds, disruption of aquatic ecosystems and birdlife, or lead to displacement of people and lack of water supply to people living downstream (www.wikipedia.org)

Technology and economic factors have limited widespread supply of solar devices.
(Francis and Abrecht, 1976)