VILLAGE OF MY DREAM

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Gandhiji wrote and spoke extensively about his dream village but somehow was never able to give a concrete plan or shape to his dreams. However intuitively he rightly realized that it would be a unit where all the things needed by villagers will be manufactured from the locally available resources. His village would therefore be self sufficient and sustainable. In those times of primitive technology his dream village was supposed to depend on human labor and hence his insistence on very simple and rudimentary technologies which could be made by villagers themselves.

However modern high technology allows for the first time to bring into reality the dream village of Gandhiji. Such a village will be high tech, self reliant, sustainable and will provide its residents a high quality life.

Our villages have not changed very much since Gandhiji's times. Thus about 55-60% of India's rural population has no electricity, very poor drinking water supply and majority of rural population uses 180 million tons of biomass every year as fuel for cooking through very primitive, inefficient and smoky chulhas. In states like U.P., Bihar, Orissa, Madhya Pradesh etc. some of the villages still exist in stone ages.

We cannot become the 3rd most prosperous country in the world, as some of our national leaders are taking about, unless and until we bring 60% of our rural population into mainstream of development and provide a quantum jump to their quality of life.

One of the best ways to do so is by providing adequate electricity to these areas. This is an electricity age. Adequate and uninterrupted supply of electricity for lighting, agriculture, communication, entertainment and whole horde of other activities can transform the lives of rural population and bring in tremendous wealth to these areas. Modern high technology together with locally available resources, can provide a mechanism to do so.

The most abundant local resource in rural areas is biomass (agricultural residues, weeds and other plant material). India produces in these areas about 600 million tons of agricultural residues/year, which can theoretically produce 70,000 MW of electric power.

However all these residues should go back to the soil to nurture it so that farm productivity increases. If it is used for power generation then the soil will suffer. A much better way to both nurture the soil and produce power is to produce biogas from these

residues. A high tech biogas producer can produce biogas with energy of about 13 MJ per kg of biomass, which is similar to that produced by burning these residues via a power plant.

Most of the freshly harvested biomass has about 50% moisture content. For using it in power plants or gasifiers one has to reduce the moisture content to about 10-15%. This requires lot of energy for drying the biomass. On the other hand the freshly harvested biomass can be directly fed into biogas reactors to produce biogas thereby saving considerable amount of energy and time. Besides the slurry from the biogas reactor produces excellent fertilizer and soil conditioner. This is the genesis of organic agriculture.

Farmers in India have realized that organic foods fetch good price. Hence there is a major movement towards organic farming. Organic farming is environmentally sound and sustainable way of producing food, since it incorporates integrated method of management which maintains the health of soil and its productivity. Farmers in developing countries who switch to organic agriculture also achieve higher earnings and a better standard of living. This can be further enhanced by the availability of excellent fertilizer from biogas reactors.

For biogas economy to succeed it is necessary to develop very efficient biogas producers. Biogas has been used extensively in rural areas and is produced very inefficiently in fixed and floating dome systems, requiring considerable amount of cowdung and other nitrogenous material. It is therefore not suitable for a household with less than 3-4 cattle. Besides there are problems of gas production during winter and improper mixing of inputs like biomass, night soil, cowdung, etc.

Thus R&D is necessary in the development of extremely efficient biogas reactors so that the production/unit of biomass inputs could be maximized. This can be done by properly maintaining pH of the slurry, temperature and other biochemical indicators. Thus the biogas plant becomes a sophisticated biochemical reactor. Use of genetically engineered microbes can also increase gas production efficiency. Thus a scenario can be thought of whereby a village level micro-utility company can be set up in rural areas which will buy locally available raw materials like cowdung, biomass, etc. and will use them in these reactors for power generation and supply the gas for cooking and other purposes.

Europe, which is in the forefront of biogas technology, has an installed electric generating capacity of about 2500 MW from biogas alone. They use very efficient and sophisticated reactors. There are reports of fleet of cars and buses running in various European countries on compressed biogas. The raw gas, which is a mixture of methane and carbon dioxide, is scrubbed to remove carbon dioxide and the resulting methane is compressed to 200-bar pressure for use in automotive applications. In Sweden an experimental train is being run on compressed biogas. A similar concept but on a smaller scale can be thought of for a village where extra biogas can be used for running modified autorickshaws and two wheelers for transport.

Our Institute Nimbkar Agricultural Research Institute (NARI) has developed a strategy whereby biogas powered diesel gensets can also produce clean drinking water as a by-product. Thus the strategy of using locally available agricultural residues based biogas gensets will produce electric power, excellent fertilizer and clean drinking water for the village. Besides the excess biogas can also be used to provide clean cooking fuel for villagers. This is true sustainability and may lead to Gandhiji's dream villages.

Thus a village level utility company can set up a 500 kW biogas powered diesel genset which can supply enough electricity for an average village with a population of 2000-3000.

In addition, the high temperature exhaust gases from these plants can easily distill or boil water via a suitably designed unit, which can be attached to the genset. A 500 kW power plant can therefore produce about hundred thousand liters of clean drinking water every day. In producing both electricity and clean water; the power plant efficiency will jump from the existing 35% to around 65%. Most of the energy of these gensets is lost in exhaust gases and cooling the engine. This energy can easily be utilized for distillation or boiling water.

The microutility company could own the plant, whose shares in turn could be owned by villagers, and be managed professionally, without the political pit-falls of a cooperative society. The microutility could also lease village-level transmission lines and infrastructure from the local State Electricity Boards (SEBs) at a 'social cost', based on the cost of electricity most SEBs charge farmers.

In order for this strategy to succeed it is necessary to set up a national biogas technology mission. This mission will help research institutes do R&D for high tech biogas reactors, provide soft loans for entrepreneurs to set up such microutilities and to encourage government, corporate sector and NGO partnership in this area.

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