The lamplighters

A pair of dedicated young scientists are working on ingenious ways to conserve energy says SHAHNAZ ANKLESARIA AIYAR

HE uses space shuttle technology for a lantern wick. And solar energy for distilling alcohol. Both become part of a lantern – which flips open into a stove.

She "makes" trees. With a little help from nature, that is. She shops for germ plasms from Mexico, Chile and the US, then does a little delicate mixing, fusses over test tubes – and scatters the results over tracts of barren land. The result – tough, fast-growing trees which function as soil cover, livestock feed and even edible food for humans.

Meanwhile, he collects dew from cold sea water and the soil. The first is turned into a perennial source of drinking water. The second waters the trees she grows in arid wastelands.

Together they work over the humble, unsung sweet sorgum plant. She breeds hybrids of this sturdy, sugar cane look-alike. Which in turn becomes high yielding sources of jaggery, sugar and alcohol. He works at creating the machinery and techniques to market these products.

What's all this, friends – another story of "perfect harmony"? No it's a description of teamwork between two scientists – Anil Rajvanshi and Nandini Nimbkar. Their focus: efficient natural resource management to meet the energy demands in this country. Their tools: modern science and technology. Their workshop: rural Maharashtra and the Nimbkar Agricultural Research Institute (NARI).

Graduates of the University of Florida, USA, Rajvanshi and Nimbkar came to India eight years ago armed with formidable degrees plus the determination to use their skills to "increase the wealth of the countryside." Their work, they say, is like "reinventing the wheel." Both come from political backgrounds. Rajvanshi's father was a close and old associate of the late Hemlal Bahugana. Nimbkar's father, a well-reputed scientist who established the Nimbkar Agricultural Institute over a decade ago, is closely identified with the Congress faction led by Chief Minister Sharad Pawar of Maharashtra.

For a while, Rajvanshi toyed with the idea of playing student politics at the Indian Institute of Technology, then saw greater potential in solar energy and went off to Florida, to join the engineering department at the university. There he met Nimbkar, who was doing research into the different uses of the peanut at the University's agronomy department.

Separately and together, despite their political backgrounds, both had clearly rejected a personal involvement in politics. He wanted to set up an agricultural institute which would address some of the seemingly intractable but urgent issues facing rural India. She, for near-identical reasons, wanted to return to India to work with her father at his institute. So – both came home to Phaltan.

They spent a year living in a room at the edge of a slum, which was commuting distance from the Institute, and slowly evolved both their own work and the development of the Institute. Clearly, a priority area of research for both of them is energy sources. Many Indian states claim cent per cent electrification of their villages. In fact, less than 20 per cent of rural households actually have electrical connections.

The rest, some 100 million families, use the kerosene lantern. But such is the nature of this country's technological progress, that, as Rajvanshi says "as soon as we discovered electricity, we forgot the lantern."

So he set about improving it. The process required much of his not inconsiderable skills in innovative engineering. Claiming he was challenged by the task of matching his own excellent designs and thoughts with the very poor material available, Rajvanshi is today poised to enter the market with his Noori lantern.

The wick of existing lanterns burns, chars and is has a low energy efficiency. Laboriously, Rajvanshi experimented with all kinds of high temperature materials, settling finally for a silica cloth used by the Indian Space Research Organisation in the space shuttle. The result – a non-charring efficient wick.

Next, he maximised the use of heat and light from the lamp's conversion of chemical energy, to create a small stove at the top of his lantern. He altered the existing mantle by using a special glass which reduces explosions and heightens the light. To improve the flame, he worked out a detailed analysis of heat, the mass transfer of combustion chemistry and flue gases to get a clear and bright flame.

His Noori gives out 6-7 times more light than hurricane lanterns, produces light equal to a 40 watt electric bulb, and costs just under Rs 200. The lantern also operates on Ethanol. Both Rajvanshi and Nimbkar see it as the fuel for the future.

The major source of fuel for cooking in rural India is wood. There is also a growing shift towards liquid fuels like kerosene (6 million tonnes imported each year for Rs 13,000 million). A renewable replacement source is necessary, and Ethanol is their answer.

Traditionally, alcohol is extracted from sugarcane or molasses. To increase its production would mean diverting shrinking land resources for growing sources of fuel, not food.

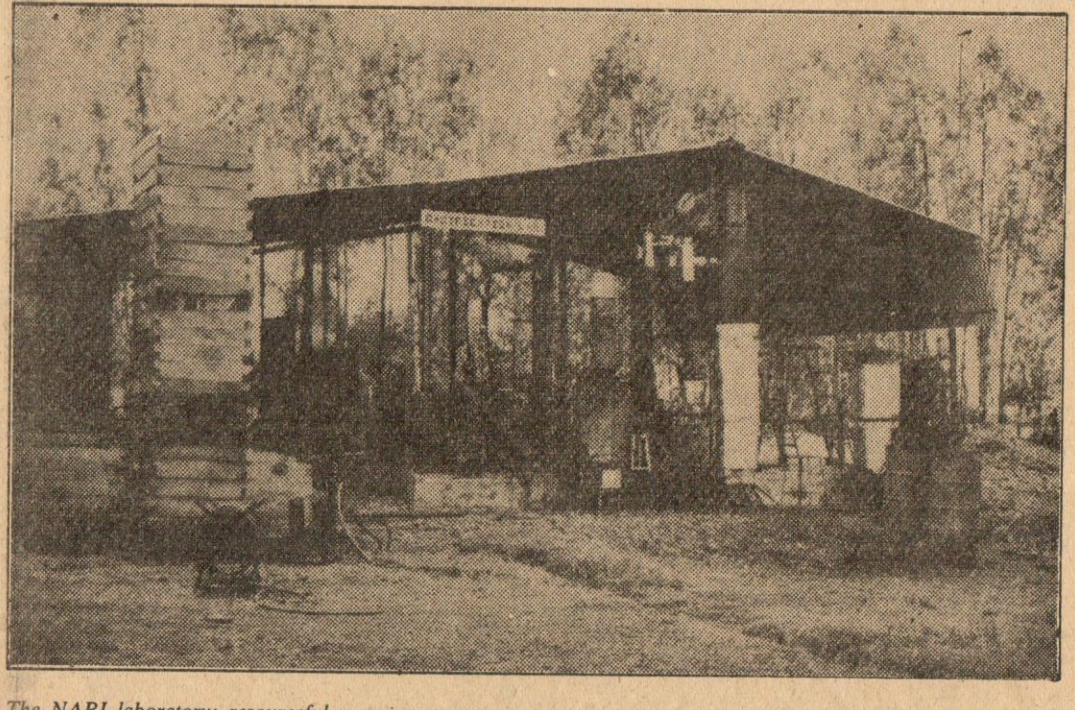
Sweet sorgum, say these two scientists, is the "multipurpose" solution. It is cheaper to grow than sugarcane, uses less water and matures faster on poor soils. You get grain from its earhead, sugar from its stalk and the bagasse is excellent fodder for animals. "No other crop yields all these things together." At NARI they have developed some 20 varieties and two hybrids of the plant. And from its juice comes Ethanol. Here too, the focus of NARI remains energy conservation. Usually the fuel for alcohol distillation is wood or bagasse at NARI they decided to use solar energy. Which meant re-designing the entire distillation process.

The result is a pilot plant claimed to be the first in Asia which can produce between 30-50 litres a day of Ethanol, run completely on solar energy. Their data shows that on a yearly basis some 67 per cent of the distillation plant's energy comes from its flat solar plates and the remainder from bagasse, with experiments underway to improve its efficiency.

But quite the most fascinating experiment conducted by these maverick scientists is dew collection. How do you grow plants, even simple ones yielding fuelwood on hot and arid wastelands with only marginal rainfall?

First you dig a pit, cover it with plasic or glass. Solar energy passes through this shield, heats the soil, which releases water bound within it. In normal circumstances, this water would not be available to a plant because of its shallow roots and insufficient osmotic capabilities. The water thus released from the soil evaporates and condenses on the underside of the plastic/glass cover. It is collected into a bottle and fed to the seedling. Tests show such plants flourish better than rainfed ones. It has exciting potential for this country.

So does NARI's experiment in desalination. By bringing cold sea water to the shore in pipes and passing it through a heat exchanger, you get dew – in 24 hours. It can be collected, treated and distributed as potable drinking water. The ponds can become marine farms. Rajvanshi is convinced that with a little more research, he can price such desalination plants at figures lower than those of existing ones.



The NARI laboratory: resourceful experiments