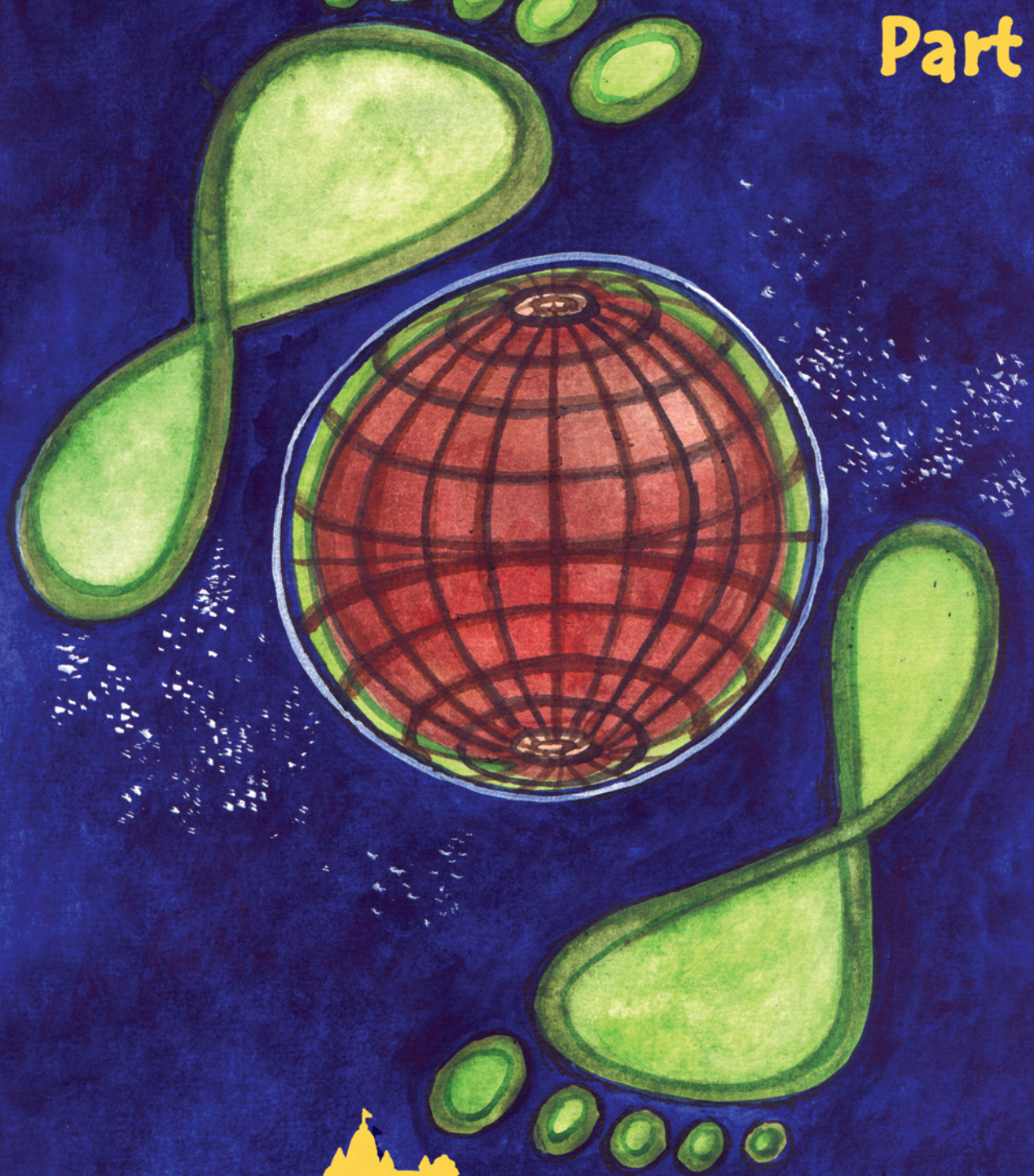
Green Pathfinders

Part I



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GREEN PATHFINDERS

Part I

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13. C.I.I. Sources, New Delhi

14. The Gandhi Peace Foundation, New Delhi, 'The Chipko movement' 1978
15. APF/WWF sources
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GREEN PATHFINDERS

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INVOCATION

त्वज्जाताः त्वयि चरन्ति मर्त्याः त्वं बिभर्षि द्विपदः चतुष्पदः।
यस्यां वृक्षाः वानस्पत्याः ध्रुवाः तिष्ठन्ति विश्वहा।
यस्यां समुद्रः उत् सिन्धुरापो यस्यामन्नं कृष्टयः सम्बभूवुः।
गिरयस्ते पर्वताः हिमवन्तोऽरण्यं ते पृथिवि स्योनमस्तु।
यस्यामापः परिसराः समानीः अहोरात्रे अप्रमादं भवन्ति।
सा नो भूमिः भूरिधारा पयोदुहामथो भरन्तु वर्चसा।
गवामश्वानां वयसश्च विष्ठा भगं वर्चः पृथिवी नो दधातु।
निधिं बिभ्रति बहुधा गुहा वसु मणिं हिरण्यं पृथिवी ददातु मे
ये ते आरण्याः पशवो मृगाः॥
वने हिताः सिंहाः व्याघ्राः पुरुषा दुश्चरन्ति।
रक्षो अप् बाधयास्मत्।
भूमे मातः निधेहि मां सुप्रतिष्ठितम्।
संविदाना दिवा कवे श्रियां मा धेहि भत्याम्॥

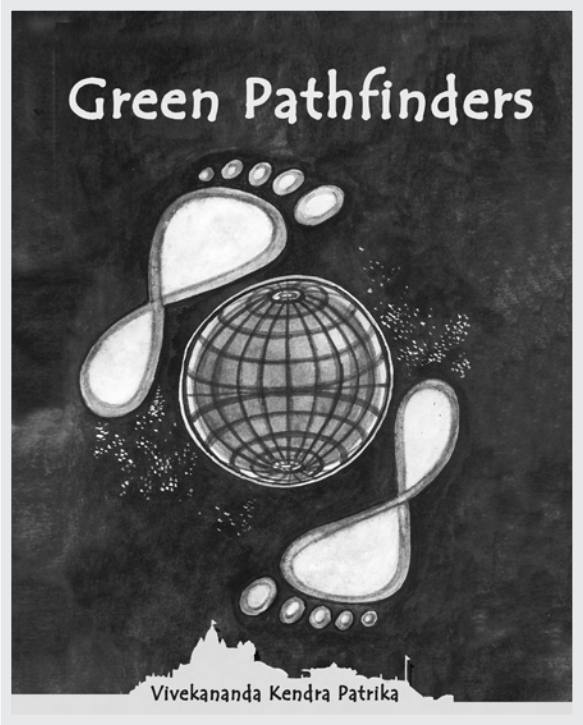
Men are born from you and function on you. You support the men and the animals.

'The trees and plants firmly stand on you. The sea, the rivers and other water reservoirs are found on you. The forest animals roam on you'.

' The birds of various kinds fly over you. The hills and mountains with rich forests stand on you. The rice and barley grow on you. The rich deposits of gold and other minerals are found in you. The autumn, winter and rainy seasons enrich you. The breeze moves on you spreading the fragrant flower dust and gently moving the trees.

O Prithvi, you are my mother and I am you son.'

Prithvi sukta of Atharva Veda



VIVEKANANDA KENDRA PATRIKA VOL.36 NO.2

GREEN PATH FINDERS

Editorial

Green Path finders is the companion volume to the earlier Kendra patrika with the title GREEN FOOT PRINTS. While the first one contained write ups on how environment is sacred, the awareness to be created among people about environment, India's intertwined Theo diversity and Bio diversity, traditions and conventions, customs and usages acting as law to protect the nature in our society, this one is about committed activists who dedicated themselves to implement policies and programmes keeping in view the protection and preservation of environment and also the requisites of sustainable development. There are also articles on the various technologies they

introduced towards the attainment of the same goal. They are all to be admired and appreciated for their valuable contribution and their models have to be emulated and updated as we move ahead.

While it is true that technological innovations are a must for ensuring sustainable development without in anyway violating natural environment, it must be remembered that no amount of technological improvisations can provide a lasting solution unless is a thorough attitudinal change in man towards external Nature. A very important fact which we often tend to forget in our impatience for achieving our material goals is that, things can really improve only when the mindset of men improves. It is the lesson of history that legal systems and constitutions cannot bring about lasting change until and unless that social mind is ready to accept them. Historian Will Durant says, “After all when one tries to change institutions without having changed the nature of men, that unchanged nature will soon resurrect those institutions”. Similar is the case with development programmes. It is the mind that determines technologies and it is culture that shapes the mind. All the three must work in harmony. In today’s setup there is total mismatch. Those who speak of development hardly think about or are motivated by cultural values. When cultural values and technologies are not in consonance with each other, the social mind gets frustrated and confused. The very purpose of development-contentment and happiness-is defeated. That is what is happening all over the world today. So there must be harmony between culture, mindset and technology. When we think about technologies suited to sustainable development we have to also make sure that what we do is in tune with our cultural ethos.

In fact, the earliest green path finders are our Rishis and also the ancestors of various communities in different parts of the world. Many of them were totally annihilated by barbarous invaders who looted not only their natural resources but also their precious cultural assets. Fortunately for India and the World, the living memories and also vibrant models of our ancient culture are still alive. Vedic literature is full of Hymns, in loving praise of Mother Nature. Those seers and sages lived in absolute harmony with nature, loving, adoring and nourishing Nature with scrupulous care. To them nature was not only the source of material support, but were also deities to be worshipped. The mutual relationship was one of interdependence, nature sustaining man and man deriving the blessings of the nature without in anyway hurting her. There is a whole chapter in Atharva Veda, called Prithvi suktha, consisting of sixty three Hymns. Each one of them is

addressed to Mother Nature in the form of our sacred motherland. An insightful reading and understanding of those Hymns will leave us wonderstruck as to how those ancient people, paid attention to even minute aspects of protecting and preserving the environment on which they depended not only for their material wellbeing, but also for their cultural and spiritual enlightenment. These Hymns show a level cultural refinement which is sadly lacking in modern civilised man's approach to nature. For example the following Hymns from Atharva Veda reveals, the reverential attitude of men towards Mother Nature.

Asambaathe bathyadhe maanpanaan yasya udhratha pravatha samam bahu
Nanabiryam aushadhiyaam pibhathrih prithivi na prayathaam raadhyathaam na

Untrammelled in the midst of men, the Earth, adorned with heights and gentle slopes and plains, bears plants and herbs of various healing powers. May she spread wide for us, afford us joy.

Atharva Veda, 12.1.2

Yathu the bhume vignaami sipram tadhapi rohitu!
Ma the marma vimugvari maa the hridhayamapirpayam!!

Whatever I dig up of you, O Earth, may you of that have quick replenishment! O purifying one, may my thrust never reach right unto your vitals, your heart!

Atharva Veda, 12.1.35

It is this attitude with which we should approach nature, to draw from nature her gifts necessary for our prosperity and happiness.

This man-nature relationship had always been at the root of our cultural and civilizational progress until modern western value system corrupted our ways of thinking and brought about disruption, if not destructions of this invaluable and inviolable relationship. Our whole cultural tradition and knowledge systems were intimately entwined with natural surroundings. They evolved organically either from the ever flowing river basins or the ever green forests. The ancient wisdom as enshrined in the Upanisads is known as

Aranyakas, which means they had their origin in the forest dwellings of the Rishis or the Gurukulas. Similarly, the dwellings of the Acharyas on the banks of the sacred rivers gave birth to the ancient cultural and value systems. This tradition was carried on for God knows how long. Our Puranas and ltihasas contain beautiful poetic description and imageries of natural beauty, the changing Rhythms of Cosmic Nature which spontaneously generates love and care for nature in all her diverse aspects. Some of the most beautiful literary products of the greatest of our poets, like Valmiki and kalidasa are so touchingly evocative of man's sensibility towards every component of Nature like creepers, trees, birds, animals etc. In such a scheme of life it is not possible even to imagine that man could harm and destroy nature.

Unlike the west, in the whole of Hindu literature you will not find a term like exploitation of nature. The word employed for deriving benefit from nature is Dohana (milking Mother Nature). The west looks upon Nature as an adversary to be conquered. Man's success is measured in terms of the conquest over nature, by regular warfare with Nature. It is just the opposite in our tradition, man and nature are eternally related in loving and affectionate mutual relationship.

Equally important is the attitude towards life. What is the meaning and objective of life? The lifestyle and value system and everything else including economics and politics will depend on the answer to this question. It has been stated in cryptic terms knowledgeable persons, "The object of the life impacts on the life style; Lifestyle defines Human relations and habits; These influence one's needs and wants, savings and spending; they impact on production and supply; and collectively all this would impact on the basic way individuals and families approach the economic model; the total human life model impacts on nature, ecology and environment." From this it is very clear that the western materialistic view of life has created a model of development which has ended up not only in a global economic crisis but also in an imminent environmental crisis, which the entire world is facing now. This model is not sustainable. It cannot preserve ecological balance. There has to be a substitute, an alternate model of development. The western model is consumeristic and driven by greed. The alternate model has to be a need-based one,which can be supported by balanced use of human and natural resources. It is possible. Gandhiji's famous saying maybe recalled in this connection. "Our Earth can provide for needs of mankind, but it cannot provide for its Greed".

Two models, the western and the eastern (Hindu) are fundamentally different in the sense that the one is greed based and the other is need based. To put it differently, the former is based on excessive consumerism-Bhoga, whereas the latter is based on restrained consumption-Tyaga. There is a famous saying of Mahatma Gandhi about the advisability of undertaking a particular line of action. He said that the acid test in such case is whether the proposed action will bring cheer to the poorest of the poor. If it does, then that line of action is advisable, otherwise not. We have to ask ourselves whether the present paradigm of development as propagated by the western materialistic ambitions is in the interest of vast majority of people, especially the most backward sections among them. Proclamations of noble intentions apart, the fact remains that the current western model has only vastly added to the number of people below the poverty line, thus widening the gulf between the rich and the poor, across the world. In fact, the goods and services goods are largely meant for those can and luxury items are in great demand for those sections of people.

Technologies are invented to make production of such items easier and more profit making. The poorer sections are left high and dry. This is a perverse form of development. Therefore, it has to be reversed. Taking a cue from Gandhiji's acid test questions that have to be asked before deciding about the paradigm of development are the following:

1. Does the paradigm of development taken into account the basic needs of all sections of people?
2. Does the priority list ensure gainful employment of everybody, both in the rural and urban areas?
3. Can these goods and services be made available to all at affordable prices?
4. Is it capable of ensuring a development pattern sustainable vis a vis human and natural resources?
5. Will it take care of the cultural ethos of the people, while ensuring material welfare along with spiritual enlightenment?

If the answer to all these questions is in the affirmative, then such a paradigm is desirable and advisable. It is on the basis of these questions that the socio-economic order based on the principles of Sanatana Dharma was envisaged in Bharat. Such an order will be flexible enough to adjust and accommodate with the changing needs of the times.

SECTION-1

Green Technologies

India is a Land of Ideas

Green Technologies

SECTION - I

Green Technologies

PRELUDE

Jnani Noval: The colonial rule of Europeans has resulted in large scale transport of raw materials and finished goods. Even though that era has ended, people continue to depend upon foreign goods, produces from far- away sources, pushing up transaction costs. On the other hand, Gandhiji used to believe that God first creates everything a human being needs and then sets him amidst them. He liked to give a definition of Swadeshi based on locally available materials, locally available technologies and appropriate technologies, which do not pollute the environment.

Krish Phidol: Energy efficient technology, which does not waste time and money in shifting goods over long distances is the need of the hour.

Annapurna Duval: Why! Our own people have done quite enough interesting work on this front - water harvesting for example.

Jnani Noval: Yes. Throughout India, the rural people are learning slowly that self-help is the best help and water harvesting and other simple technologies, have to be designed specifically for each area. Universal formulae, forged else-where, do not work in your village. Similar is the case for rural industries. J.C. Kumarappa pioneered our efforts to restore our rural technologies to their old glory. Gandhiji called J.C. Kumarappa a doctor of rural industries. The local people having lived with the raw materials around them for generations, knew how best to utilize them for their own income-generation and other advantages.

Annapurna Duval: Same is the case with house-building.

Jnani Noval: The so – called modern trend is to ignore local topographic variations, climatic conditions, the user's needs and try to make universal designs which can serve any situation. Laurie Baker and other masters of appropriate house-building technology

fought against that trend. They believed in the collective wisdom of ages, which combines economy and comfort and serves the dwellers' specific needs adequately. Baker used to say that tradition has allowed our rural people enough time to experiment and learn and to put up structures that go with the immediate environment, economise on building-material and give maximum comfort. The Earth movement by Auroville advocates the use of the local soil as construction material; The Kerala builders have found excellent building material in laterite which becomes very hard when dried.

Annapurna Duval: And there is the question of keeping the hands of the farmer engaged outside the farming seasons and put some money into his pocket. All appropriate-technology uses man-power to the maximum and saves on needless expenditures. Our washermen, carpenters, ironsmiths, cobblers and barbers made good use of materials available locally at no or little cost. The washer-man would scout for soda-rich local soil for washing clothes. The carpenters knew the local timber varieties and used them aptly. The ironsmiths had working knowledge of various methods of tempering, alloying, designing iron tools. They were aware of the types of wood that burn to give charcoal of appropriate ranges of heat-energy. Local tanning and curing techniques served our cobblers very well.

Jnani Noval: Our people continuously innovate. When R.A. Mashelkar former Director General of CSIR asked a branding expert what brand name he would give India, the reply was "India is a Land of Ideas" Our people are instinctive innovators.

Krish Phidol: We farmers, village dwellers, observe nature and we learn from it. We may be a bit slow, but we do innovate. Our innovations stand the test of time.

Jnani Noval: Mashelkar adds. "We had a nation-wide competition for grass-root innovators. Nearly one thousand entries came. We selected the top thirty. The top three were actually illiterate people. One of them was semi-literate. Their findings were amazing. They were working in the laboratory of life."

Krish Phidol: We can work in the fields of conserving water, economic utilization of water and create a proper atmosphere in the villages where positive mind-set and constructive activities can flourish. What is important is to bring people together as functional groups, productive groups. This is where culture helps, tradition helps.

Jnani Noval: Appropriate technology can make use of modern science, modern management techniques. In agriculture also local irrigation techniques, water sharing and water-saving procedures, seed-collecting, seed saving, seed-storing methods, sowing and plant – protection methods were used by our farmers profitably. Harvesting and post-harvesting procedures served our farmers well. All the operations were done at no or little expenditure. Even in preserving human,

animal and plant health, these three were considered as inalienable part the local environment and were treated with locally available materials, outside medicines being exceptions rather than rules. The important criterion is to use local talents, to apply local materials and prevent the capital flight. Here self-help groups can bring forth the collective strength of the society.

Annapurna Duval: Villagers are struggling to get adjusted to new flushing toilets which waste much of our precious water.

Jnani Noval: Even flushing toilets call for new scientific methods. The water-gobbling-toilets do not fit into the areas where water shortage is prevalent. The septic tanks can contaminate - the ground water if leakages spring. People are experimenting with water-free toilets.

The role of science is to help us understand how exactly energy is used in a rural technology and enhance the efficiency of every application. The same holds good in the case of water also. Our engineers, technicians and simple users of water can come up with appropriate technologies for water purification, desalination, recycling etc.

Annapurna Duval: Let them do that fast; my plants are thirsty.

Jnani Noval: The over-all effect is much more than mere conservation or economy of productive operations. The appropriate technologies made man constantly aware of his role as a part of the local environment

Let them do that fast;My plants are thirsty

living in harmony and not as an intruder, aggressor or exploiter. He took away as little as possible from under his foot, and brought in very little from outside say something like a match box, kerosene or salt. This life-style would be sustainable, both on short-term as well as long-term basis. He will not pollute, release green-house gases into the atmosphere, or leave indestructible residues (like plastic).

J.C.Kumarappa ~ Life And Works

Joseph Corneleus Kumarappa (1892-1960) was Gandhi's colleague and co-worker who expounded his economic thought in the most holistic and original manner through his writings and life work. A chartered accountant and an economist by training, having had his education in England and U.S.A., he was having an Europeanised life and traditional Western outlook. This was before he happened to study the economic relationship of Britain with India and realise its exploitative nature. The more he went into the depth of things the closer he got to Gandhi. He underwent a complete metamorphosis, changed his life and joined Gandhi in 1929 becoming his right hand in giving shape to his revolutionary economic ideas. His study of Public Finance in the British Rule was taken up as a basis of the freedom struggle.

He went into the life of the poor of the land through various in-depth studies of Indian villages through on-the-spot surveys. He was an original thinker and prolific writer whom Gandhi first asked to teach in his university and edit his journal. He later chose him to head the All India Village Industries Association, which he formed to give shape to his concepts of decentralised production by the masses. Kumarappa became the leader of villagism movement and pleaded for a system that was ecologically sound and brings about social justice. However his forthright strong criticism of the British Rule and the exploitative economic order of the day brought him in conflict with the ruler and twice he was imprisoned for his writings and was in all for three years behind the bars. He lived the life of renunciation and sacrificed his all for the cause he held dear. A bachelor all his life, he never accepted any office of power.

His books "Why the Village Movement" and "Economy of Permanence" prompted

Gandhi to call him 'Doctor of Village Industries.' Gandhiji in his preface about the contents of the book wrote, "This doctor of our village industries shows that only through them shall we arrive at the economy of permanence in the place of that of the fleeting nature that we see around us at present." After his other studied publications, 'Practice and Precepts of Jesus' and 'Christianity, its economy and way of life,' Gandhi wrote "Indeed Prof. Kumarappa has a message beyond the confines of India. He speaks with confidence born of a living faith that West, though nominally Christian, has not known the true Jesus of the gospel." He combined in himself the scholastic and the visionary, the idealistic and the practical and the spiritual and the scientific.

At a time when the world is facing the depletion of fossil fuels on which depended the economic growth of the last two centuries, Kumarappa becomes all the more relevant. He gave a call to shun using non-renewable resources of the earth which, in thirtees itself, he proclaimed belonged to a 'Bucket Economy' (where the water is depleted as it is used up) and exhausted that what we need is a 'River Economy' (where water is being constantly replenished). His clear philosophical thoughts on Man-Nature relationship and the individual's and collective's responsibilities being ideally symbiotic in nature, weave through all his writings. He stressed the principle that physical work is a necessary expression of one's individuality and that drudgery, creativity and leisure are its components of an indivisible whole. On this basis he pleaded promotion of decentralised production through village industries. The non-violent economy based on self-sufficiency in essential goods has been thoroughly delineated in his writings to its scientific details. The significance of his thinking becomes still greater as time passes and the ideas he propounded and the concepts he stood for have become still more universal transcending space and time.

He was a crusader all through his life and even after India got her independence he could not reconcile himself with the governmental policies of the day because even they continued to follow the same old centralised western model. He travelled far and wide not only in his own country but studying the economies of other countries of Europe and Asia and cogently put forth Gandhian economic thoughts in the world context.

J.C.Kumarappa -
Right Living Values Culminate in Environmental Values

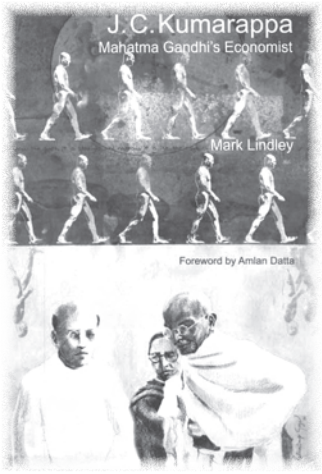
P.S.Sandhu

J.C.Kumarappa was the economist who became one of Gandhiji's closest associates and the most ardent advocate of his ideas on rural development.

Through his prolific writings in books and magazines over 20 years, starting in 1929, Kumarappa outlined an economic doctrine that is remarkable for its farsighted emphasis on conserving the environment.

Kumarappa's ecological concerns grew out of a deep awareness of the harmful effects of unchecked industralisation. He contended that the only sustainable social order was to be based on "the economy of permanence." In that human beings collaborate with nature to meet their needs without disrupting natural patterns of growth and renewal. This could be achieved through a decentralized model of economic planning aimed at making villages self-sufficient so that they make optimum use of local resources. This was the message of RIO too.

Kumarappa examined such issues as conservation of water and forests, effect of erosion and water-logging on soil quality and availability of fodder and fuel in the rural economy. Handmade paper from waste, organic manure, instead of fertilisers etc. form the core of his technology which is full of ecological consequences. The environmentalists of today are only taking up from where he left off.



Born in a true Christian family and imbibing its spiritual and moral values, J.C.Kumarappa went to England to pursue higher studies in Accountancy. He also qualified himself in Business Administration and Economics from American Varsities.

Talking and researching on Indian culture and its economy, J.C.Kumarappa discovered

the ruin Britain was inflicting on India's economy. He turned a Nationalist. He was also drawn to study the moral and social dimensions of economic decisions.

J.C.Kumarappa was drawn to Gandhiji as their economic nationalism was identical in spirit and form. On Gandhiji's advice, J.C.Kumarappa undertook an economic survey of Mater taluka of Gujarat. This, under the auspices of Gujarat Vidyapith where he worked as a professor, exposed J.C.Kumarappa to the realities of the village life and village industries. He adopted Indian way of austere life, tuned to Khadi, and saw the holism of Gandhiji's teachings.

J.C.Kumarappa's thesis on Indian poverty was serialised in Gandhiji's magazine—Young India. He contributed to it more, ending up as its editor.

He devoted his entire life for the Nation having the nation as his only family. He became the head of All India Village Industries Commission, with Maganwadi, Wardha as his Headquarters. He revived village industries such as bee-keeping, oil pressing, soap making and pottery – thereby reviving the self-respect of the villagers. He was convinced unwaveringly that making villages self-sufficient through small scale industries was the key to the regeneration of national life. He travelled widely to lecture on decentralised planning. These lectures were published as the book "Philosophy of the Village Movement."

In 1937, J.C.Kumarappa was made the member of National Planning Commission. He resigned the membership when he failed to convince Nehru of the centrality of village industries in Indian economy.

J.C.Kumarappa could not hold on to Government posts and assignments in an emerging scenario under Nehruji's leadership. Marginalised, he turned to voluntarism as the solution to the problems of National economy. He died in 1960 working for his ashram near Madurai.

In his life-time J.C.Kumarappa's theories were not popular. He was much ahead of his time. The debate between environment and development, may end in favour of his stance. Social regeneration through moral appeal to the individual was the core of his programme.

Extracts From Kumarappa's Writings:
On the virtues of a natural life:

If we have to utilize as food the nutritious elements found in nature, we may get gur from palm trees that grow wild on uncultivable lands and obtain the whole benefit of the sap, minus the water which it contains, along with the sugar in a digestible form, and various minerals and salts. But man, in his anxiety to use his knowledge, puts up sugar mills, converts good lands, which may be used for cultivation of cereals, into sugar-cane growing lands and then the sugar-cane is converted into sugar, wasting the bulk of the minerals and salts in the molasses, which are thrown out as unfit for human consumption and from which he prepares rum and gin to poison the people.

On natural resource use: The land we draw our sustenance from, the water, sunlight, air and the rest of the physical world claim our attention and regard while we strive to satisfy our needs. If we fail to consider these factors, nature will retaliate with violence in the form of pain, disease and death. Taking all these factors into consideration, man has to pick his way through skilfully, so as to obtain the greatest benefit to himself with the least harm to others and the minimum disturbance of the natural order.

On recycling: A scientific use of resources should mean that we get the fullest benefit out of what we find around us. Man, in his eagerness to use mechanical devices, is often irrational in the utilization of resources. For instance, if paper is to be made out of bamboo by the simple hand process, we do not use bamboos cut fresh from the forest. The bamboos in the forest, when they are first cut, are used in various ways, for roofing, for being made into mats, sieves, baskets and other household articles and then, when they have served their term as such, the broken and used up bamboo pieces are converted into pulp and paper is made from it.

On forest management: The government will have to radically revise its policy of maintaining forests. Forest management should be guided, not by consideration of revenue but by the needs of the people…. Forest planning must be based on the requirements of the villagers around. Forests should be divided into two main classes: 1) those supplying timber to be planned from the long range point of view, and 2) those supplying fuel and grasses, to be made available to the public either free of cost or at nominal rates.

(**Extracts from the Articale March 31, 1991.)

Kutthampakkam Goes the Kumarappa way

A.K.Venkatasubramanian

J.C.Kumarappa was described by Gandhiji as the Doctor for village industries. He dreamt of village production for villagers' consumption. Kutthampakkam Padoor Road, Tiruvallur district, Tamil Nadu, keeps alive Kumarappa's dreams.

Shri Elango, an engineering graduate is the president of the Kutthampakkam Panchayat. He believes in Gandhian ideals and walks the path shown by Kumarappa. Elango is the President from 1996. The panchayat president has almost succeeded in eradicating illicit liquor, but the people displaced by this change demand jobs.

The government scheme of food for work is properly implemented here. A few rural industries are being run by women's self-help groups. They are 1.Oil pressing 2. Soap making 3. Tailoring 4. Bakery 5. Milk production 6. Electrical works, and 7. Preparing pulses out of whole grains.

Oil pressing industry supplies good quality edible oil with a little profit margin. Much of the pulses, oils, soap and milk produced here are sold locally, saving transaction costs.

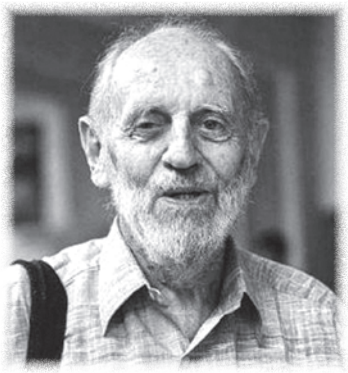
A survey of the needs of the surrounding villages has led Kutthampakkam to go for tailoring for uniforms for school children, manufacturing note-books, school bags etc. The electrical units prepare stainless steel reflectors for street-lights. College-educated youths show interest in creating job-opportunities for others.

A trust named Village–Self–Governance Trust, accepts foreign help for capital expenses. The trust is planning for self-employment for 120 local people.

(Translated from Tamil, Dinamani 3/11/2004)

Baker's Contribution To Architecture

Gautam Bhatiya



1. Introduction:

Laurie Baker Uvaca

I learn my architecture by watching what ordinary people do; in any case it is always the cheapest and simplest because ordinary people do it. They don't even employ builders, the families do it themselves. The job works, you can see it in the old buildings—the way wood lattice work with a lot of little holes filters the light and glare. I'm absolutely certain that concrete frames filled with glass panels is not the answer.

My clients have always been Indian. I've not even had the foreign-returned to deal with, since I work primarily with the poor and I've always wanted to give people what they want and what they need which obviously is all Indian. My feeling as an architect is that you're not after all trying to put up a monument which will be remembered as a 'Laurie Baker Building' but Mohan Singh's house where he can live happily with his family.

Gautam Bhatiya:

Laurie Baker has worked in India for over forty years now. He is one of the very few architects who has had the opportunity and the stamina to work on such a remarkably varied spectrum of projects ranging from fishermen's villages to institutional complexes and from low-cost mud-housing schemes to low-cost cathedrals. In Trivandrum alone he has built over a thousand houses. Besides this, his work includes forty churches, numerous schools, institutions and hospitals.

It is not only the number of buildings that Laurie Baker has designed and the range of architectural commissions he has executed that sets him apart from other architects. What makes his work even more remarkable is the way in which he draws creative sustenance from the environment in which he works absorbing vernacular patterns of construction and individual styles of living

to such a degree that he is able to give his clients the comfort and ease of homes and institutions that are firmly rooted in the soil upon which they stand. All this is done keeping in mind the special needs of those who will inhabit or use these places.

In the designing of these varied projects, Laurie Baker takes half-forgotten vernacular patterns of design and construction from the rural setting to dislocated urban residents whose building choices are often limited to the unsuitable structural concepts discarded in the West. In every building that Baker designs, he asserts the appropriateness of traditional constructions to local conditions, adapting existing locally-available materials and traditional methods to contemporary urban structures.

A recognition of Baker's contribution to architecture has a singular timeliness today. It has come at a time when a questing conscience has provoked—to look inwards, to solutions of its own making. In these circumstances, Baker in India remains a lone protagonist, experimenting singly and quietly in a distant corner of the country and providing information on the causes and results of his numerous architectural interventions.

In both, his work and writings, Baker emphatically rejects the 'inter-national style' that lingers so perniciously in India. The French architect, Le Corbuiser, who designed Chandigarh, spawned a host of acolytes seeking a universally applicable architectural technology. The result of this is seen in the post-fifties buildings of almost every city in India. Baker has never

accepted the idea that the multiplicity of human needs and aspirations can be fulfilled by a standard set of design options and materials. He believes that individual needs stem from India's diverse environment, the varying cultural patterns and lifestyles; and he feels that these needs must be met through an architecture which is responsive, uses local materials and expresses itself in many different forms.

In Baker's scheme of things, architecture cannot be transplanted without doing violence to those very needs which it is attempting to meet. When, for example, the introverted patterns of desert architecture are transferred to the fertile landscapes of the Kerala coast, it dislocates traditional patterns of living. Parallels to this may be

seen in any mass-housing scheme, when all-too-often, inhabitants are compelled to camp uncomfortably within unsuitable contours and divisions of space.

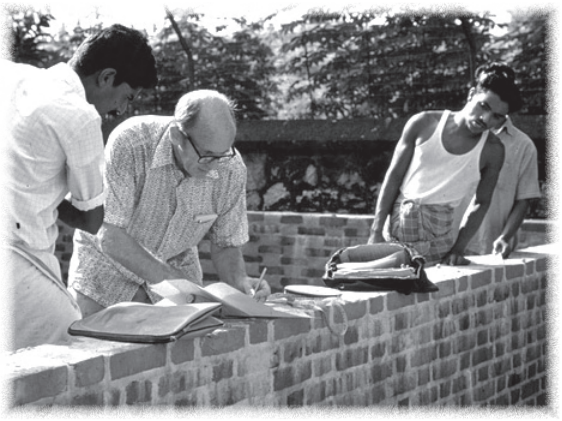
However, Baker is no conservative. He is at pains to emphasize the fact that living architecture thrives on appropriate assimilation and adaptation. Indeed, its vitality frequently stems from its ability to change and to meet the changing needs and perceptions of its inhabitants. Architecture, like any craft, is an organic, evolving form and traditional patterns are not the rigidly-structured creations of individuals but the collective experience of many generations. Baker's architecture draws inspiration from the work of successive generations of builders, from the imprint of the environment and those who have lived in it. In his the imprint of the environment and those who have lived in it. In his case it happens to be his adopted home state of Kerala in south India.

The building techniques Baker has evolved to suit specific problems of his poorer clients in Kerala is not a formula applicable to all similar situations; and yet, from it stems an entire ideology of architectural practice—a pattern that is revolutionary in its simplicity and its contradiction of the accepted norms of architecture in contemporary India. Baker's work is an effective demonstration of his own strength, his own interpretation of tradition, technology and lifestyle.

2. What factors influenced Baker's architecture?

Laurie Baker Uvaca

Distinctive architectural styles were not designed by some famous ancient architect who decreed that a certain style will be used in Japan and a certain other style will be used in Peru and yet another style in Punjab. The upturned, horned roofs of buildings as found in Kerala, China and Japan are the direct result of the people of those places making use of the most common, plentiful, useful material: bamboo—to house and protect them from natural enemies such as sun, rain, hurricanes and wind. A completely different set of styles has evolved in hot, dry, treeless, desert areas, as in parts of Egypt,



Laurie Baker at Work

Iran and India; in almost every district in the world these natural styles have grown to the patterns that could be seen in the first half of the twentieth century.

Our 'backward' ancestors had learned how to live with and cope with the problems of climate. They had learned that a pitched or a sloping roof lessened the effects of all these hazards. They knew the movements of air currents and placed their wall openings

almost at ground level. They knew that hot air rises and allowed it to travel upwards from the low eaves to the openings at the end of the high ridge. They understood and applied principles of insulation; their roofing materials formed hollow cellular protective layers and their storage spaces provided insulation from the midday sun. They had understood that wall surfaces can absorb and retain just as much heat as a roof surface, so they kept these walls as small in area as possible and never left them unprotected. They knew that eye-strain from working out in the sun could be alleviated by rest in an area where glare was eliminated and they used smooth, hard, light-coloured surfaces sparingly and left the natural materials—wood, brick, stone—exposed. Their practical knowledge of the properties of these differing building materials was amazing. They knew, for instance, how to design their timber and wood work to avoid warping, twising and cracking.

Gautam Bhatiya:

Laurie Baker's philosophy of architecture is inextricably bound with his experiences of childhood and youth in England, and later, in the Pithoragarh district of Uttar Pradesh in the Himalays where he lived for sixteen years.

One of his earliest architecture-related memories is that of being baffled by the differences in the styles of houses at the seaside, where he went on holidays, and that of houses in the mountains, where he lived.

3. Is Laurie Baker the founder of new architecture?

Laurie Baker Uvaca

I am these days sometimes quoted as an expert or an authority on 'appropriate' or 'intermediate' technology and although I did not know it at the time, it was my life and experiences at Pithoragarh that taught me 'appropriate and intermediate' technology….

To me, this Himalayan domestic architecture was a perfect example of vernacular architecture. Simple, efficient, inexpensive…. As usual this delightful, dignified housing demonstrated hundreds of years of building delightful, dignified housing demonstrated hundred of years of building research on how to cope with local materials, how to

cope with local climate hazards and how to accommodate the local social pattern of living. It dealt with incidental difficult problem of how to build on a steeply sloping

site, or how to cope with earthquakes and how to avoid landsliding areas and paths. The few examples of attempts to modernize housing merely demonstrated, only too clearly, our modern conceit and showed how very foolish we are when we attempt to ignore or abandon these hundreds of years of 'research' in local building materials…

Gautam Bhatia:

The direct and honest use of local materials created its own expression of structural necessity, of economic restraint. Confronted with building materials like rock, mud, laterite and cow-dung, Baker's architectural practice in the Himalayas was anything but conventional. His education at the Birmingham School of Architecture and the skills acquired during his professional apprenticeship in England became decidedly insignificant in the austere mountain environment in which he found himself. He realized that the local people knew how to use materials more effectively than he did.

It was a very unusual sight to see an English architect, with an urban background, working with and learning from mountain tribesmen and village masons, and using indigenous materials for building. However, it proved to be a richly fruitful alliance. Baker learnt to adapt his skills and training to the needs with which he was now faced. He built schools, hospitals and community buildings, all of which ran on a self-supporting basis.

The strength and the organic resilience of Badker's early architecture was the direct outcome of his own strength and resilience. And, in turn, the years of continuous settlement in a single place gave his designs a quality of rootedness. The lessons he derived from this experience in the Himalayas and the architectural principles he learnt there remained with him even when, years later, he resumed practice in Trivandrum.

The Bakers left Pithorgarh in 1963 and moved to a similar hill area in central Kerala. They settled in a remote village, Vakamon, inhabited by tribal people and Tamil migrants, and continued to work in much the same way as they had in Pithoragarh—building schools and leprosy treatment centres, using their skills and training for the benefit of the local people, and learning local skills as they did so.

In Trivandrum, Baker applied all that he had learnt to a wider clientele—building homes for the middle class and institutions for a wide range of organizations. Today, over a thousand families in the Trivandrum district live in Baker's houses; and the evolution of his style can be traced through his work in and around this city.

As he worked, Baker began to understand the essential simplicity that is at the base of effective, living architecture. He refined his style, stepping away from unnecessary accoutrements. A chance encounter with Mahatma Gandhi at the beginning of his career seems to have made a great impact of his architecture, as Gandhi's ideologies were to influence him in all his work.

Though this is not the single most persuasive influence in Baker's life, in the course of several discourses of the Mahatma, Baker imbibed the meaning of one of his most persistent messages—that change in post-independent India can be brought about

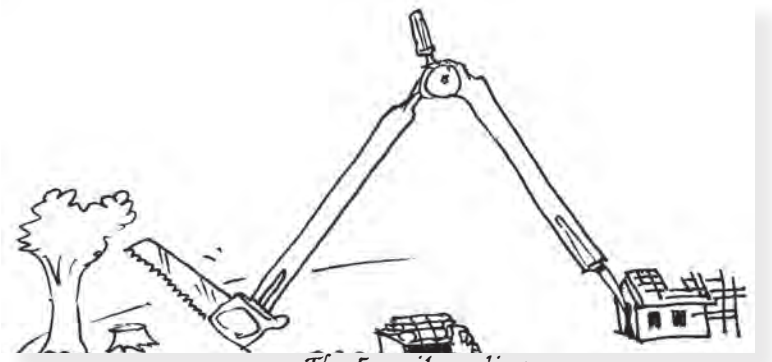
only through education and revival of the local crafts and cottage industries; that is, real independence can be only achieved by self-reliance and by encouraging local craftsmanship. Unfortunately, much too often this message has been lost in the muddy waters of politics and the race to modernize India. Thus Baker's work is more relevant particularly now than ever before.

4. The Gandhi influence

Laurie Baker Uvaca:

I believe that Gandhiji is the only leader in our country who has talked consistently with common-sense about the building needs of our country. What he said many years ago is even more pertinent now. One of the things he said that impressed me and has influenced my thinking more than anything else was that the ideal houses in the ideal village will be built of materials which are all found within a five-mile radius of the house. What clearer explanation is there of what appropriate building technology means than this advice by Gandhiji! I confess that as a young architect, born, brought up, educated and qualified in the West, I though at first Gandhiji's ideal was a bit 'far-fetched' and I used to argue to myself that of course he probably did not intend us to take this ideal too literally.

But now, in my seventies and with forty years of building behind me, I have come to the conclusion that he was right, literally word for word, and that he did not mean that there could be exceptions. If only I had not been so proud and sure of my learning and my training as an architect, I could have seen clearly wonderful examples of Gandhiji's wisdom all round me



The 5 - mile radius

throughout the entire period I lived in the Pithoragarh district.

Gautam Bhatia:

His qualities emanate from a deeply-held belief that each piece of work is an offering to God and must, therefore, not only be without flaw, but must not violate God's creation in the making. From this stems a natural inclination to use the materials cautiously, leading to a conservationist approach to design. Baker's deep convictions and the persistent intentions supported this architectural expression.

5. The contextual relevance of Baker's work

Laurie Baker Uvaca:

There is a general belief that India is wealthy, both in simple basic building materials and in potential labour forces. Then there is a firm unyielding belief that all this talk of 'low-cost building' should not be 'for the poor' but for all. Furthermore, although we possess a certain amount of more sophisticated building materials, such supplies are comparatively small and must be used to maximum advantage. For example, we possess steel but the fact remains that many mechanical industries have a stronger claim on its use than the building industry, which can, if it wants, find substitutes and alternatives.

Gautam Bhatia:

At the turn of the twentieth century, architects genuinely believed that the modern movement would provide new techniques and new materials to serve the needs of ordinary people. It seemed as if technology could provide a solution to the persistent problem of housing, and it was believed that high-tech buildings would ultimately improve the standard of living for everybody.

However, rapid industrialization only seemed to increase the demand for housing that has now grown to unimaginable proportions. Housing has come to be dominated almost entirely by commercial builders employed by local governments—both of whom look upon a house as a commodity to be produced and sold in large numbers. The once-new technological solutions of the modern movement have fossilized into rigid inflexibility in their hands. The comfort and lifestyle of the individuals for whom the mass-housing schemes are intended are very rarely considered. The result is all-too-visible in cities all over the world. Especially, in Third World countries such as India, as governments struggle to house the ever-increasing numbers of urban dwellers, the inadequacies of the forty-year-old doctrines of modern architecture have been brought more sharply into focus. Moreover, as the gap between available resources and the need for housing has increased, the inflexible sterility of the modern movement has become even more apparent.

Mass-housing and emphasis on the improvement of living conditions is all a result of the new industrial economy. Humanistic considerations are no longer the primary logic for the evaluation of design. This has

led to a break from tradition and given us an increasing number of impersonal, anonymous buildings. Unfamiliarity with this new kind of architecture adversely affects the psyche of the people inhabiting it.

Laurie Baker Uvaca:

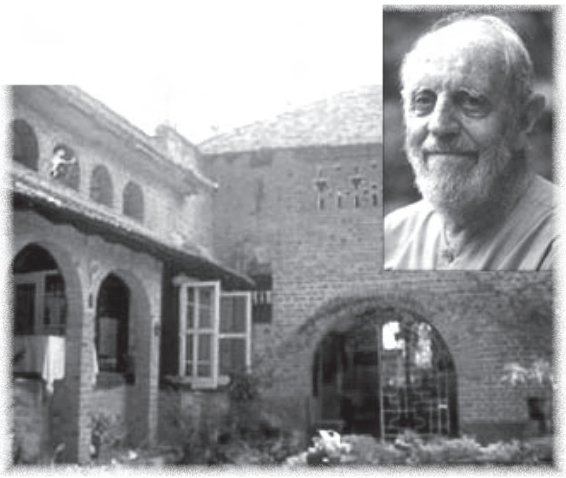
The necessity for speed was one of the big factors that contributes to that break with tradition. It probably took a thousand years for us to find out by trial-and-error how to make a mud wall impervious to rain and wind, another thousand years to learn how to keep termites out of it, and another two or three thousand to learn how to build multi-storeyed mud buildings.

Gautam Bhatia:

Though Baker is not a founder, practitioner or product of the modern doctrine in any sense, he was, in own career, demonstrated similar concerns. But, unlike the movement, in his endeavour to improve living conditions architecturally he seeks a purposeful link with tradition.

Baker's work can be viewed as part of a much larger worldwide effort to re-examine architectural values. In the 1960s, the new architect's rejection of establishment values was an admission that the profession was out of touch with the times. Ordinary human needs to which the modern doctrine was as wholeheartedly committed seemed imprisoned in unfamiliar buildings and surroundings. The increasing inability of government agencies to produce adequate housing led architects in several parts of the developing world to examine architectural priorities. The work of John Turner in Latin America and Hassan Fathy's experience in Egypt paralleled the quiet revolution that Laurie Baker was enacting in India.

Each one sought the development of a contemporary vernacular—a commonly observed, felt and accepted language of building which would be transformed to suit the new requirements. The prevalence of an overriding craft tradition and the need to evolve buildings out of severe economic constraints shifted the emphasis away from technology towards an earthy humanism. Such a transformation required a sharp



comprehension of the dual phenomena of tradition and change; and of the need to re-establish the use of traditional construction without the loss of vitality, the vitality, that accompanies change.

6. Is a Modern Indian Architecture Possible?

Laurie Baker Uvaca:

In most countries of the world architects are being accused of failing to produce a modern form of their own previously-distinctive architectural styles. If one or two typical modern buildings from each country could be transported and put down in isolation in a large flat desert, could any of us, even architects, walk from one building to another and say 'Ah! A modern Fijian masterpiece' and 'Wow! Just look at this one—pure Italian' and further on 'My! This is obviously an Indian effort!' A hundred or so years ago we could probably have been successful with such identifications, but there are very grave doubts whether we can do so now.

Does this mean that we have failed in our job?

Fifty years ago (in 1940s) we were taught that a building must have an identity. We could certainly tell by looking at a building whether it was domestic or commercial or industrial and so on. It also had its geographical and cultural characteristics. In India there is an incredible wealth of regional architectural styles, and there is not the faintest possibility of confusing one with another. Even where the same materials have been used for building, the climatic, cultural and regional variations are so great that different methods of construction have been used to produce unique individual styles. Further, these distinctive styles apply not only to big and important buildings but also to the smallest domestic structures. Really we can say that the buildings of any small district are a quintessence of that district's culture and skill.

But these distinctions cannot be found anymore. What has happened?

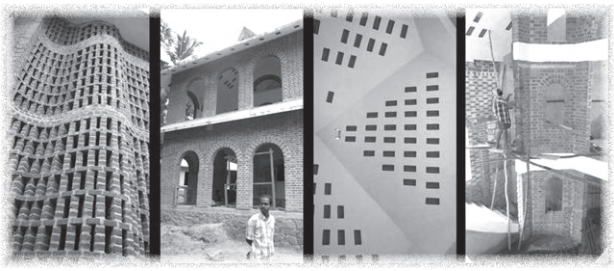
For one thing—cement. Modern Portland cement came and suddenly our slow, steady, evolutionary building process came to a devastating and tragic halt. Cement and steel were joined in holy matrimony and lo!—their child was this universal anonymous expressionless 'modern architecture' which tells you nothing except that reinforced concrete has been lavishly and brutally used. The saddest thing about it is that reinforced concrete has been lavishly and brutally used. The saddest thing about it is that reinforced concrete is a wonderful material that can do almost everything fantastic and exciting. It can stand, soar, twist, hang, swirl, gyrate, encircle, defy and placate. But we rarely ever let it do any of these exciting things. We merely imitate the building practices of the Dravidians, with their square stone pillars and split stone beams; and when in a very dare-devil mood we cantilever out the beam-ends to an uncomfortable length, we think we are really and truly 'modern'.

Of course, we have a third deadly material, glass—with which we fill in all the holes. The result of this modern but static style of architecture, is that everybody's buildings, be they in Bombay, Birmingham, Bologna or Buenos Aires, look the same.

Consolingly, 'high technology' has also

taught us that there is no need to concern ourselves with the weather or the functions for which the building will be used, or the variations in the cultural patterns of our clients—'high technology' appliqué-work can cope with all this old-fashioned 'nonsense'.

I think the time has come to ask ourselves a lot of questions. Could we have done something different? Should we have done something different? What does 'modern' mean? Can't we be 'modern' with other materials besides reinforced concrete, glass and aluminium trimmings? Can't we go back to the year 1 BC (Before Concrete) and carry on with that wonderful history of research and development by applying twentieth



Brick Jalis , Arches - Speciality of L.Baker

century knowledge and know-how while still showing love and respect for all that has gone before us?

Perhaps speed has been one of the major contributing factors leading to that catastrophic break with tradition. It probably took a thousand years for us to find out by trial-and-error how to make a mud wall impervious to rain and wind, another thousand years to learn how to keep termites out of it and another two or three thousand to learn how to build multi-storyed mud buildings. But we did do it, and our enemies on the other side of the hill also did it, though in their own way which was different from ours. Now 'developed communications' has taken the 'wonder material' to all the corners of the earth and we have succumbed to it like children falling upon a dish of instant hot cakes. So we all have identical pot-bellies and have forgotten 'mother's cooking'. Fortunately, the rebellion against 'instant mixes' has already begun and there is a yearning for 'fresh-compost-fed-vegetables and whole meal-bread'—so may be there is hope that we too as architects, can as our road signs say, 'Stop! Look! Proceed!'

In view of the fact that there are over twenty million families in India without any sort of shelter, that we have to import cement from Korea to make up for the shortfalls, that we are using up a lot of our energy resources at an alarming rate, and that we have bred some of the top brains in the world of science, we should, for instance, in areas where mud has been the traditional staple building material, show how modern we can be with mud! Where burnt brick has been the main building material can't we produce bricks with less energy and use them in a modern way? There are experiments which show that this sort of thing can be done along with the new sender materials to produce buildings that are 'modern', beautiful, characterful and identifiable with a particular region and its people. For example, in the State of Kerala there is high rainfall, strong

winds, powerful tropical sun and a lot of humidity. The result of ancient research and development work was a steeply-pitched roof which threw off torrential continuous rains and protected walls and rooms from the glare and heat of the sun. It all made good sense and good architecture. But concrete and glass towers are incredibly expensive because of all the antics required to cope with rain and sun, and they are quite useless without the air-conditioners, fans and louvers of aluminium strips. Can 'modern' architecture only be vertical of wall and flat of roof? Couldn't we throw off rain and protect from sun and show that we are doing it effectively, even by being modern'?

Since the beginning of recorded art, India's brains had devised the Jali (trellis, lattice, honey-combed walling, pierced stone and wooden screens and walls) to filter the glare and strong sunlight into cool but breeze-filled rooms. India has used this device more than any other country and it is essentially an Indian device. We can study the many and varied components of Indian architectural design and find out what makes them essentially and intriguingly 'Indian'. Only then can we create an Indian-ness into all our materials and designing. Then our 'modern' 'Indian' architecture will be a continuing, growing, crowing glory to our great heritage.

Extacted from the book: Laurie Baker Life, work, writings: By Gautam Bhatiya Viking / Hudco. New Delhi 1991

That is why plants are called The Brahma's hair:

15% of the heat in a building can come through the roof. That is why it is important to insulate the roof. In industrialised countries roof-top gardens are becoming a norm, Green-roof tops cut down a building's energy conumption. They add to the aesthetic value.

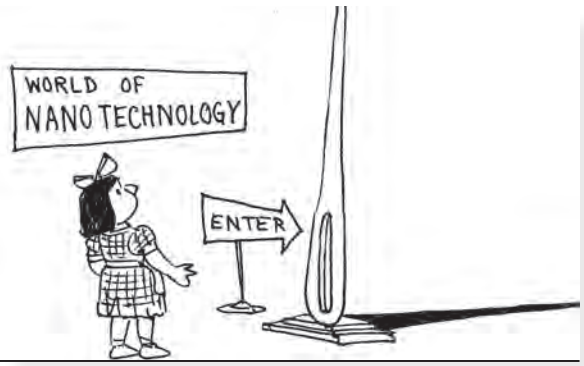
(DTE 31.8.07)

An Introduction to Nanotechnology

C. Srinivasan

Nanoscience and nanotechnology have become the most interesting and exciting fields in recent years in Physics, Materials Science, Chemistry, Engineering and Biology. Almost daily we hear these words through news papers and other media. There is a great expectation that in the near future, breakthroughs in nanoscience will transform present day technology with unbelievable applications. Nano in Greek means dwarf i.e. very small and actually an nanometer is one billionth of a meter (10^{-9} m or 10^{-7} cm). Miniaturization of several devices are very convenient for mankind and because of this, these days we use laptop, palmtop, mobile phones, digital cameras, i-pod etc. Like Alice, in Wonderland, scientists working in this novel area are in Nanoland witnessing several spectacular properties of nanomaterials. Though the terms nanoscience and nanotechnology are of recent origin, phenomena associated with nanomaterials exist from time immemorial. For instance, the brilliant colours of some butterflies are today recognized as arising from diffraction of visible light from nanosized biomaterials. Colloidal gold, with its beautiful ruby-red colour, has fascinated people for centuries. It was used extensively as a cosmetic, a decorative pigment as well as for medicinal purposes. Michael Faraday carried out the first scientific study on colloidal gold, silver and other metal aerosols and hydrosols in 1857 and concluded that that these solutions contained metallic particles in a "highly divided state". The intense colours associated with metal colloids are a consequence of the absorption and scattering of light. Even today one can see Faraday's colloidal solution of gold prepared in 1857 and kept in Royal Institution Faraday Museum, London revealing that gold nanoparticles are more precious than pretty gold!

Nanoscience involves research to discover novel behaviours and properties of materials with dimensions at the nanoscale, which ranges from 1 to 100 nm or approximately



from 10 to 106 atoms or molecules per particle. Definition of nanomaterials based on dimensionality is given in Table 1. It may be mentioned here that the size of colloidal particle vary from 1 nm to 1 m (10^{-9} cm to 10^{-6} cm).

Nanomaterials - Defination Based on Dimensionality

Nano materials	Characteristics	Electron confinement	Name
QD & Metal Nps	All three dimensions nano	e^- movement confined to all three directions	Q-D nanomaterial
Quantum wire	Two dimensions nano, other large	e^- movement confined to two directions	1-D nanomaterial
Quantum well	One dimension nano, other two large	e^- movment confined to one direction	2-D nanomaterial

Why are nanomaterials so important? These particles have large surface area to volume ratio which is ideal for catalysis or sensors. Also they exhibit interesting mechanical, electrical, electronic, magnetic properties and some reflect light better or change colours as their size is changed (Figure 1).

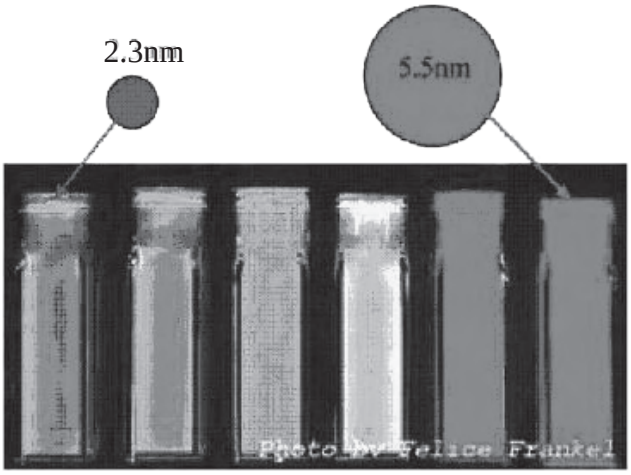


Figure 1. Cadmium selenide nanoparticles of various sizes exhibiting different colours

Feynman in his prophetic lecture entitled "There's plenty of room at the bottom" delivered in December 1959, visualized the field of nanotechnology with far-reaching consequences. Though his thinking did not resonate with scientists at that time, since then, this area of research has progressed by leaps and bounds mainly because of the availability of several sophisticated tools at the disposal of scientists. The term nanotechnology was first coined by Norio Taniguchi (1974). NASA's

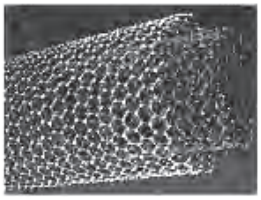
definition: "The creation of functional materials, devices and systems through control of matter on the nanometer length scale (1–100 nm), and exploitation of novel phenomena and properties (physical, chemical, biological) at that length scale". Nanoscience and technology got an impetus with the discovery of fullerenes in 1985 by Kroto, Curl and Smalley.

Several physical and chemical methods are available for synthesis of nanomaterials of metals, semiconductors, ceramics (oxides, carbides, sulphides, nitrides), and polymers.

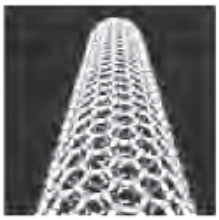
Various types of electron microscopy like scanning electron microscopy and transmission electron microscopy have been commonly used in characterization of nanoparticles (for thin films). The sizes of nanomaterials in colloidal solution may be conveniently measured by dynamic light scattering technique. Scanning probe microscopy (SPM) is a relatively new characterization technique and has found extensive applications in nanotechnology. Scanning tunneling microscopy (STM) and atomic force microscopy (AFM) are the two members of the SPM and both techniques produce topographic images of a surface with atomic resolution in all three dimensions.

The element carbon is as important in nanotechnology as silicon is for electronics. Amorphous carbon, graphite and diamond are the well known allotropes of carbon. Graphite is a layer structured material and each layer is held by van der Waals forces. A single layer of graphite is called graphene. Physical properties of graphite and diamond are distinctly different. New carbon forms have been discovered in recent years and they are fullerenes, carbon nanotubes (CNTs) and graphene. Laser vapourization of graphite in an inert atmosphere by Kroto, Curl and Smalley

Fullerene – C60



MWCNT



SWCNT

Graphene

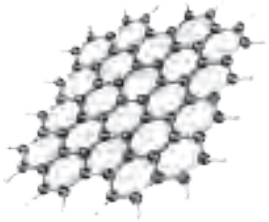


Figure 2. Various forms of carbon

revealed that the plume comprises C60 (major quantity) and C70 (minor quantity) molecules which are collectively called fullerenes. They proposed that C60 contains 12 pentagons and 20 hexagons (Figure 2) and C70, 12 pentagons and 25 hexagons. For this work these three Scientists were awarded 1996 Chemistry Nobel Prize. With the electric arc discharge method proposed in 1990, C60, the bucky ball, was readily available for scientists to play.

Iijima (1991) observed a change in the cathode in the arc discharge method for the preparation of fullerenes. Some needle like particles were deposited on cathode and on electron microscopic examination, he found that multi-walled carbon nanotubes (MWCNTs) were present. Subsequently single-walled carbon nanotubes (SWCNTs) (Figure 2) were also prepared.

Graphene (Figure 2), a thin film of carbon atoms that is one atom thick, has been isolated in 2004. Graphene is the mother of all graphitic materials. Thus graphene can be wrapped up into fullerenes, rolled into nanotubes or stacked into graphite.

CNTs are stronger than steel, but they are light and behave like straw. During wars Damascus swords, were used till 19th century. They were strong, but at the same time malleable. These swords were manufactured from the steel sent from South India. A recent study shows that the presence of CNTs is responsible for the interesting properties of Damascus swords. CNTs are used in baseballs, tennis racquets and some car parts because of their greater mechanical strength at less weight per unit volume than conventional materials.

Field emission property of CNTs is being exploited in developing flat panel display. CNT replaces Si in field-effect transistor and due to its tiny size, the nanotube transistor should switch reliably using much less power than a silicon-based device. Also it is now possible to accommodate more number of transistors than 108 per sq. cm and hence the speed of a computer will be enhanced. Radio system that receives radio waves wirelessly and converts them to sound signals through a nano-sized detector made of CNTs is another interesting application of CNTs

In medical field, nanomaterials are likely to make a revolution. As virus and bacteria are of nanosize, nanotechnology would offer ways of fighting back. Bandage with nanosize silver particles penetrate the skin and work steadily and there is no need to change the bandage daily. Garments treated with metallic nanoparticles prevent colds and flu, destroy harmful gases and protect from smog and air pollution. CNTs can be used in drug-delivery. Though the current treatments of cancer by surgery, radiation and chemotherapy are successful in several cases, these curative methods also kill healthy cells and cause toxicity to the patient. It would therefore be desirable to develop methods to directly target cancerous cells without affecting normal ones. Recent research demonstrates the potential use of SWCNTs to treat several types of cancers, with minimal or no toxic effects to normal cells. SWCNTs are slightly modified and the cancer chemotherapy drug doxorubicin is attached on the surface

of the nanotube and this will target only cancerous cells.

Green Nanotechnology is usually defined as a set of technologies that offer the possibility of changing the manufacturing process in two ways: "Incorporating nanotechnology for efficient, controlled manufacturing would drastically reduce waste products; and the use of nanomaterials as catalysts for greater efficiency in current manufacturing processes by minimizing or eliminating the use of toxic materials and the generation of undesirable by-products and effluents."

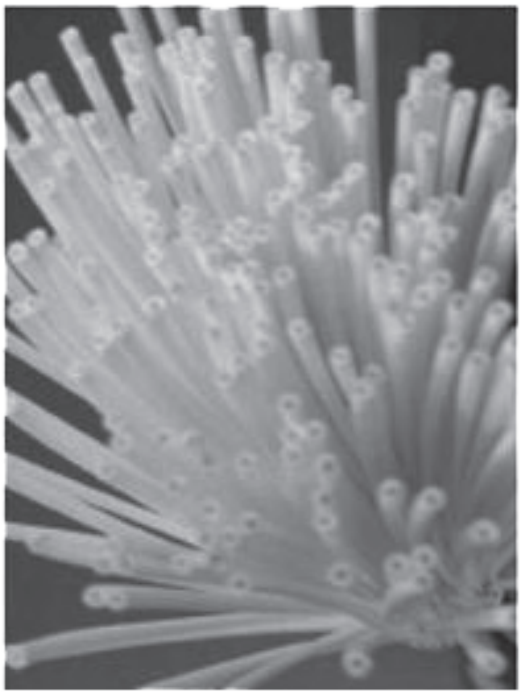
Clever nanotech designs are being used to create a new generation of environmentally friendly protective coatings for metals and surfaces to prevent corrosion and that could help save crores of rupees as well as help against environmental damage. Current studies have resulted in finding more environmentally sound solutions, including a novel approach that uses nanoparticles and bacteria to create tough protective coatings with anti-bacterial type properties. This method will find a huge range of applications from power plant pipes to surgical instruments and implants.

Nanotechnology has the potential to offer significant opportunities for preventing pollution and protecting environment. One example is that titanium dioxide photocatalysis is employed in self cleaning, anti-fogging, water treatment, antibacterial effects, and air cleaning applications.

O. N. Srivastava, (Banaras Hindu University) and Ajayan (now in USA) have established that CNT membrane can be used as a filter to remove *E. coli* and polio virus from water, thus paving the way to get pure drinking water. It is also believed that magnetic interactions of nanoscale rust could lead to the development of a revolutionary, low-cost technology for cleaning arsenic from drinking water.

Global warming is the increase in the average temperature of the Earth's near-surface air and oceans since the mid-twentieth century. The observed increase in global temperatures is ascribesd to the recorded increase in anthropogenic (man-made) greenhouse gas concentrations via the greenhouse effect.

VOCs (Volatile Organic Compounds) and carbon dioxide (CO2) belong to the category of greenhouse gases which are liberated



in huge volumes from waste gas streams as the result of many industrial processes including power generation from thermal plants. Around 24,000 million tonnes of CO2 alone are released per year world wide, equivalent to 6,500 million tonnes of carbon annually, contributing dramatically to global warming. VOCs damage the environment, pose a serious risk to human health and also contribute to the loss of valuable resources. Reducing the emission of volatile organic compounds is therefore a key issue.

Recent technological developments suggest that nano-porous fibres (Figure 3) trap volatile hydrocarbons and other gases so they can be removed from the air flow. Wherever possible the trapped gases can be removed and recycled back to the production process. This is actually a molecular sieving process. At present the technology has been geared towards the beverage industry, where recovery and reuse of CO2 could lead to significant operational savings. The technology can be applied to many types of gases - VOC, and hydrogen sulphide.

The advances in nanotechnology are likely to provide realistic, cost-effective methods for harnessing renewable energy sources and keeping our environment clean. Experts in this area believe doctors can detect disease at its earliest stages and treat illness such as cancer, heart disease and diabetes with more effective and safer medicines.

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Small approach, big benefit

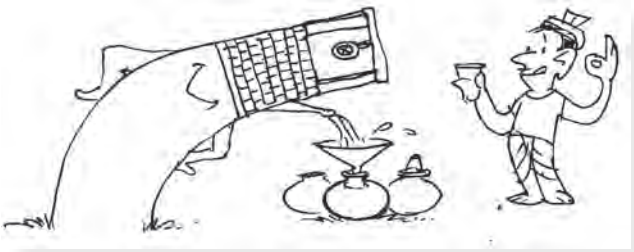
(Nanotechnologies offer an economical way to make water potable)

- Today, as many as 20 countries are classified as 'water scarce', based on their current sources of renewable fresh water vis-a-vis demand. This number is going to rise to 34 by 2025. Also, quality of drinking water is falling due to the increasing presence of pathogens. About half the people in developing countries are exposed to contaminated water

- Globally, 1.1 billion people lack access to basic water supply and 2.6 billion lack access to basic sanitation.About 4 billion cases of diarrhoea occur every year, claiming nearly 2.2 million lives. Almost 90 per cent victims are children under five, which means diarrhoea kills 4,500 children a day, or one child every 20 seconds

- To purify water, nanofiltration technologies have emerged as an option that is cheaper than most existing water cleaning technologies in terms of efficiency, maintenance and energy required to operate them. Besides, these technologies do not require the use of any chemicals

- Conventional filters (such as sand filters) cannot remove dissolved salts, like arsenates, and some soluble inorganic and organic substances and bacteria. But nanofilters and nanomembranes have a real chance of removing bacteria, protozoa, viruses, and heavy metals like arsenic, mercury, lead, chromate, cadmium, and many harmful salts. However, nanomembrane technologies are costly compared to conventional methods. A conventional filtration plant can be set up at 70 per cent of the cost of a nanomembrane plant



Nanotechnologies-filter

- Advanced mechanical filtration like diatom filtering and reverse osmosis can perform on the nanometre scale. But diatom filtering cannot remove

chemical impurities due to large sizes of pores while reverse osmosis wastes 60-87 per cent of water and is slow

- Nanofiltration membrane technology is widely used to remove dissolved salts from salty water, remove micropollutants, soften water and treating wastewater. In Chennai, energy costs in desalination is about Rs 50 per 1,000 litres of water. Nanofiltration processes can bring down the energy required for desalination by 20-30 per cent. Besides, this technology selectively rejects substances in water, thereby enabling the retention of nutrients like calcium

- Nanofilters can remove up to 99 per cent of ammonia from contaminated waterways and sewage outflows. This allows the water to be recycled while the ammonia removed can be re-used as fertiliser. Nanofilter membranes, however, cannot satisfactorily remove certain ions such as those of nitrate and fluoride from water

- Poor people in the developing world spend up to 25 per cent of their real income to have access to clean water. A fusion of conventional and nano-science based technologies can ensure safe water without any additional cost

- Simple and affordable water treatment/ filtration methods and materials, when suitably treated or impregnated with nanotechnology-based methods could filter more effectively and increase health benefits. For instance, four layers of an old sari can produce a nanoscale 30 mm mesh that can remove up to 99 per cent of cholera bacteria from water

** Extracted from the Article

Nanofactor: What it cleans

- Sodium Chloride; 99 per cent
- Sodium Sulphate: 99 per cent
- Ammonia: 99 per cent
- Calcium Chforide: 99 per cent
- Magnesium Sulphate: >99 per cent
- Sulphuric Acid: 98 per cent
- Hydrochloric Acid: 90 per cent
- Viruses: 99.99 per cent
- Protozoa (cryoptosporidium, resistant to chlorine used in municipal water): 99.95 per cent
- Bacteria: 99.99 per cent
- Trichloroethytene from groundwater: 98 per cent
- Magnetite nanoparticles are very effective adsorbents for Arsenic, at low pH

At an atom's level

(Nanotechnology has immense potential, but it is also a little-known area with many dangers)

T.V.Jayan

How would you find the prospect of little machines crawling inside your innards to cure some terrible disease? Intrigued? Repulsed? Welcome to the happening world of nanotechnology, where scientists work on atoms and molecules to fashion intrusive devices like the one described above. In less than 20 years after the American scientist Eric Dexler described a powerful manufacturing system where robots the size of bacteria join individual molecules to form products—or are programmed to replicate themselves—nanotechnology has progressed enough to blur the divide between fantasy and reality. A report jointly published by the UK's Royal Society and Royal Academy of Engineering in July 2004 notes that the number of patents granted in nanotechnology has increased nearly four-fold between 1995 and 2002—from 531 to 1,976. Estimates indicate that the current global investment in nanotechnologies is about US $6 billion—more than US $2 billion of that comes from private sources.

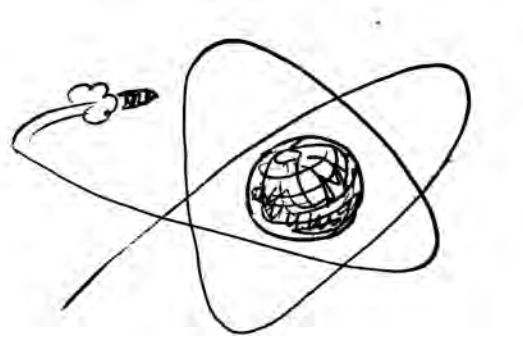
But what exactly is nanotechnology? It is a set of techniques where scientists and engineers manipulate matter at the level of atoms and molecules to build devices and systems. Unlike "biotechnology" where the word itself lets you know that bios (life) is manipulated by human art (techne), nanotechnology indicates only the scale of the art. A nanometer (nm) equals one billionth of a metre. Its dimensions are about 50 times smaller than a typical virus and a strand of human hair is about 80,000

nm. The materials of this technology are chemical elements of the Periodic Table—stuff that makes up everything on this universe, including the DNA.

What lures scientists to research matter at a nano-scale? At this level, matter is chemically more reactive and its optical, electrical and magnetic behaviours change. And then, matter can even permeate human skin and deceive the ablest immune system to deliver drugs; medicines can in fact be delivered directly to diseased cells. Ability to make precise manipulations at the nanoscale also opens up a world of other potential applications. Computers can get smaller and faster and sensors can monitor everything—from crops to cows to crooks to chemical warfare agents to customers.

But be warned

The possibilities of nanotechnology are indeed immense. Hold on, critics also tell us of its potential dangers. For instance one of its avatars, nanobiotechnology merges three advanced frontiers of science—nanotechnology, information technology and biotechnology—and according to the Canada-based activist organisation ETC Group, "Controlling Bits, Atoms, Neurons and Genes adds up to a little Bang theory enabling a godlike mastery over all knowledge, matter, mind and life."



Powerful Nano Technology

And such possibilities are rife in some of the areas in which new nanobiotechnology firms are working: incorporation of non-living, nano-scale materials in living organisms (such as drug delivery systems or sensors to monitor blood chemistry); creation of new synthetic materials that have biological components (such as proteins incorporated into plastics). But why should we worry? Aren't pacemakers and artificial joints also examples of introducing non-living mechanics into the human body? Yes they are, but let us not forget this new technique operates at the nono-scale. Such materials can penetrate our immune system and even cross the blood brain barrier. A foreign nanoparticle has no problem of bio-compatibility because at the nano scale, there is no clear distinction between the biological and non-biological. Prospects of nano-technology—nanobiotechnology in particular—are indeed both scary and exciting.

And such contradictory prospects are even truer when products of the technology are living organisms themselves. Inside the human body they might continue to do what nature intended to procreate. And this may cure illness but also play havoc upon our immune system.

A growing field

Right now, supporters of the technology are overwhelmed with its potential. They say that the E coli bacteria can take on oil spills and the nanobiopolymer car door can use embedded proteins to repair itself after a collision. And there is no shortage of funds for such research. Since 1999 about 52 per cent of the US $900 million venture capital funding for nanotechnology has gone to nanobiotechnology startups. Today there are several projects to develop newly made nanobioorganisms. For instance, Craig Venter—known for his work on the Human Genome project—and his Institute for Biological Energy Alternatives in Rockville, Madison, USA have been awarded US $12 million by the US Department of Energy to create new life forms engineered to produce energy or clean up greenhouse gases.

Other biotechnologists are building new life from stripped-down microbes, nanotechnologists are building biological machines from the bottom-up. The implications are breathtaking: not just new species and new biodiversity, but life forms that are human-directed and self-replicating. Consider this: scientists at the Nanometer Consortium at Lund University and Sweden, on the other hand, have produced tiny forests of nano trees. These "trees", though inanimate, can be "taught" to replicate plant photosynthesis and extract energy from sunlight, says Knut Deppart, a Lund University professor involved in the study.

Among other examples, US researcher Robert Freitas is developing an artificial red blood cell that can deliver 236 times more oxygen to tissues with natural blood cells. The artificial cells, called a "respirocyte", measures one micron (1000 nm) and has a nanocomputer on board, which can be reprogrammed remotely via external acoustic signals. Freitas hopes his device can treat anaemia and lung disorders, but also will enhance performance is physically demanding areas such as sport and war.

Have regulations

According to projections of the US National Science Foundation, the world market for nanotechnologies (nano-biotechnology being the prominent one) is going to be US $ one trillion by 2011-2015. Given the sheer magnitude, scientists and critics alike feel that there should be regulatory frameworks at national and international levels to control the run-away growth leading to potential threats—though they disagree on the degree of regulations. The UK's scientific bodies recommend extensive health and safety studies of these novel technologies. They have asked all regulatory bodies in the country (in fields such as health, environment and industry) to debate if the current level of regulation and expertise is adequate to protect humans and the environment from the hazards of nanomaterials, including nanobiotech products.

The ETC group, which in mid-2002 called for a moratorium on use of synthetic nanoparticles in the lab and in any commercial products until governments

adopt a "best practices" for research, on the other hand, says current regulations are at least a decade behind. "Nanotech products are already available commercial and laboratory workers and consumers are exposed to nanoparticles," says the group's executive director Pat Mooney.

Ony a few companies in a handful of countries control nanotechnology today. So, an even greater worry is that unregulated scientific quest for finding newer commercial applications might result in these companies and countries ignoring all accepted safety norms.

** Extracted from the Article (31.08.04)

Gandhi Counts

(On Gandhiji's 50th death anniversary)
In 1997 America's nationally circulated daily newspaper 'US TODAY' had invited its readers to name the person whom they consider as the most influential in the 20th century. Around 10,000 readers sent their choices. Out of these the first four and their votes were as follows:

Mohandas Gandhi	8848
Mother Teresa	524
Albert Einstein	225
Thomas Edison	144

All The rest of the names were suggested by less than 100 readers.

Check-dams perform a miracle

Soma Basu

President K.R.Narayanan has presented the villagers with a pleasant problem on 28/3/2002.
The chatter laced with excitement among them was about how to spend the Rs.100,000 award given to the villagers of Bhaonta-Kolyala by the President for being the "best environmental community" of the country.

"We will build more 'johads' (earthern check-dams)' – there was no dispute over the response, as the villagers went their way crossing many a crescent-shaped earthen dam dotting the undulating hilly and rugged terrain along Arvari river here. The water bodies shimmering under the bright sun in the arid region were no mirages but proof of the magic performed entirely by the locals of nearly 700 villages in this district.

The "nightmare" of yesteryears is gone. With lack of vegetation and acres of degraded land, four per cent of Aravalli was becoming wasteland every year. The scarce monsoon run-off washed away the top soil and crops failed regularly. There was not a single blade of grass but many caracasses of cattle all around. Drought, poverty and forced migration made the region look like war-ravaged. For the people, it was a struggle for survival.

Then started happening. One October evening in 1985, five young men belonging to you Tarun Bharat Sangh (TBS), a Jaipur-based voluntary organization fighting injustice against people, arrived at nearby Kishori village.

"It was like landing in a battlefield here, without knowing who to fight and how," Mr.Rajinder Singh, the key man of TBS and popularly known as 'dariwale ajnabii (bearded Stranger)", told The Hindu here. "The traditional wisdom of the area sought the greenhorns out when an old villager,

Mangulal Patel from adjacent Gopalpura, told us: don't simply talk, dig tanks and build johads."

That marked the beginning of an unprecedented water harvesting campaign. The rich tradition of building johads—which capture and conserve rainwater, improve percolation and recharge groundwater—was alive in the collective subconscious of the people. Just that push was provided by Mr.Singh and his team to alter the rural environment.

However, he recalled, as work through persuasion picked up, bureaucracy came in the way. "We were denied permission to build dams and fined for planting trees. When fish arrived in the revived Arvari river, the Government gave out contracts to private agencies and banned the villagers from fishing in the river, which they had brought back to life with zero Government help."

But people resisted all threats, determined to fight ecological destruction which was causing economic and social degradation. Today, 3,500 water harvesting structures in the district stand testimony to the will of the masses, who no longer waste time waiting for Government support.

As men began returning to their villages to join in the water movement and build johads, the TBS slowly withdrew from active participation to give more meaning to Gandhiji's 'gram swaraj'. Water easily became the focus of every village and every villager worked to see water oozing out of totally dried up wells. And when villagers work together to regenerate the environment, there are "unexpected blessings".

After decades of sand, heat and infertility, the basin of not only Arvari but four other rivers in the region has discovered perennial water, prosperity and abundance. Land under cultivation is five times higher now than in 1995. Milk production is up by 10 times.

Scant rainfall is haunting the region for the past three years but villages in the river catchment areas have enough water for irrigation and other needs. This is proof that just 20 percent of rainwater trapped by check dams can regenerate environment and resuscitate rivers and wells.

What is further admirable is that the villagers have gone beyond harvesting rainwater. They have formed the "Arvari River parliament" to settle any dispute on water sharing and for regulating the use of ground and river water in the area. The villagers have exploded a myth called drought.

(* Extracted from the Article 29.3.2002)

Effective Microorganisms

By Karmayogi

The small is significant. We realize it only when things go wrong. The value of things is seen only in their absence. We have heard of micronutrients in agriculture. When the value of vitamins was first discovered, medical science found that permanent ailments could be cured by small doses of the missing vitamins. A Japanese scientist working in agriculture accidentally noticed the inherent values of MICROORGANISMS. He found them effective, developed his theory, practised it and published books on it 10 or 15 years ago. He called it EM, effective microorganism. His theory is interesting.

To him the life of the soil is infinitely larger than we are using. We use, according to him, only 5% of the effectivity of the soil. He calls that part positive. As against it, following the natural law of opposite dualities, there is 5% of negative effectivity in the soil. The rest of the 90% of the soil is neutral. Suppose, for some reason the positive 5% is increased to 10% the neutral 90% shows a tendency to turn positive and that makes the soil rich. He says it is true even if the 5% is increased to 6%. His practice was successful. He wrote books on it. They were welcomed by an eager market. Now he says farmers from several countries including India have started using it. He does not give the name of the place. His continued experiments and their increasing success led him to think that earth's pollution can thus be neutralised. He extended his experiments to human health and even there met with striking success.

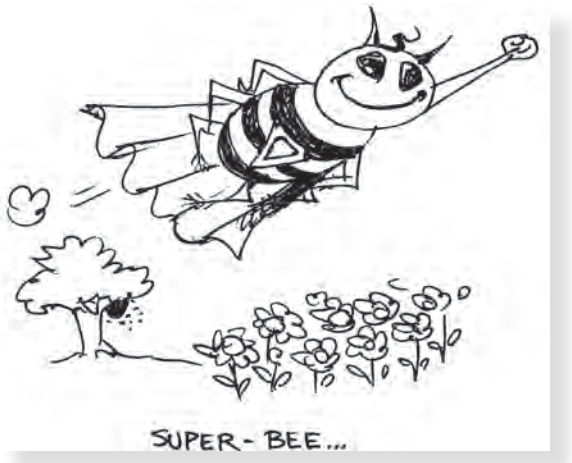
Micronutrients are physical. Microorganisms are of life—vital—and we can extend it to the MIND. Their representative in the mind is opinion. Change one opinion of yours, a miserable life becomes a happy life. There lies the value of HUMAN CHOICE. Business in the West is booming. One of the reasons is they have changed their opinion about the customer. Originally the idea was the customer should buy what is sold or produced. Now they find out what the customer wants and produce it. Sales have boomed.

Let us take a family where the atmosphere is quarrelsome. Let them teach themselves to look at the ISSUE from another man's point of view. Suddenly all quarrels will vanish. When the spirit is awake it is capable of seeing the other man's point of view easily.

(From The New Indian Express)

Tapping bee power to increase crop yield

Honey apart, bees are being used by many countries to enhance crop yield, but India is yet to tap this potential. Had India paid enough attention to utilise the services provided by bees, it would have helped it become self-sufficient in oilseeds and pulses production, says a report in "Current Science". The other crops that could benefit from bees are onions, beans, coffee, alfalfa, grapes, oranges, litchis, apples and plums.Bees help improve production in self-sterile plants that depends on outside agents such as wind, Insects, birds and water to disperse pollen.



The report says that even by conservative estimates, edible oil production would have touched 37 million tones, an increase of 66 per cent over the current output. This would have made India one of the largest exporters of edible oils instead of an importer.

It is estimated that the U.S. earns about eight million dollars annually due to enhanced crop production from bee pollination.Similarly, Malaysia became a global leader in the production of palm oil within a decade after the introduction of weevil, an insect, for facilitating pollination. The report says even countries like China, Mexico and Argentina are far ahead of India in apiary exports, while India is unrepresented in this export area. Though rapid developments have taken place in bee science in other countries, it is in a state of mess in India, though the National Commission for Agriculture has recommended its promotion two decades back, the report says.

The report finds it "appealing" that the commission's recommendations aimed at increasing bee population and their applications have been treated with

"disdain" resulting in economic losses to the country. It says bee research in India is in a 'neglected' State with a severe dearth of researchers. There are only about a dozen scientists who are working one bee-related branches and after a brief stint they readily switch to other subjects. Bee science is conspicuously omitted from the list of subjects covered under Indian Council of Agricultural Research, though it covers a vast array of subjects.The only bee research institute located in Pune has been allotted under the Khadi and Village Industries which has 'no science or research background', the report says.

A wide range of crops like pulses and oilseeds are self-sterile, that is pollengrains from the same plant do not result in fertilization. Such plants depend on other agents—wind, insects or water – for seed formation and fruit production during the flowering period.

The report says indiscriminate use of pesticides, chemicals and intensive farming practices in recent years have caused a steady decline in the number of natural pollinators inhabiting soil, making "pollinator management" even more important. Bees can easily fill this void as they have finely branched hair that can trap thousands of pollen grains during their search for nectar.They transfer pollen as they hop from one plant to other. Unless pollination is aided by providing bees in self-sterile plants, the report says "any amount of fertilizer or other measures may not give even a fraction of their potential yields".

In the U.S. researchers have developed and commericialised non-honey bees for pollinating specific crops.

Unlike honey bees, which lie in colonies, these solitary bees inhabiting plant parts are plant specific. Pollinating efficiency of non-honey bees is so high that only

less than thousands bees are adequate to pollinate a hectare of crop whereas 50-60 times the number of honey bees would be required for the same purpose. They can also been easily transported to the fields, reducing the need for moving bee hives.

The report says "India with a wealth of bee-pollinated crops grown over a third of the area, can reap benefits comparable to U.S. "provided this eco-friendly, low-cost method can be harnessed to its potential".

One bee colony comprising about 20,000

bees can easily pollinate plants within 35 km of the hive. On field trials carried out in Punjab, moving bee hives in sunflower fields produced yield 300 per cent in excess of the average, which is "unequalled by any other crop, even rice or wheat for which it is reputed", the report says. Similar success stories for apple in Himachal Pradesh and Kashmir, horticultural crops in Mahabaleshwar in Maharashtra and coffee in Kodagu in Karnataka are, however, isolated cases.

Extracted from the Article

SEED SAVERS

Binayak Das

In Maharashtra, Raigarh district's Kashele village has its own Academy of Development Studies. It wishes to conserve the rare rice varieties of the Konkan area. It has established a Rice Bank. RH Richharia the eminent rice scientist has collected Indigineous strains of rice. 370 varieties have been identified and collected. The rice varieties have been classified as early, medium, and late maturing types. The researched and new (modern) varieties introduced have damaged the soil because of intense use of chemical fertilizers and pesticides. Risk of epidemics has increased because of the monoculture. The land has got degraded. The genetic base has narrowed. Cultivation costs have gone up. Farmers want to return to conventional seeds, but they are not easily available. Hence the necessity for the seed bank.

The old varieties provide long strands of straw, which can be used for roofing. The old varieties also check soil erosion on the hill slopes. They do not pollute the soil and the water there. Old varieties did not have diseases like the stemborer. The new varieties call for chemicals, but the chemicals kill frogs and fish that would eat away the worms that bore the stems. Regular seed distribution camps prior to the sowing season proper, documentation of the seeds and the plants, including their annual changes, proper interaction with the farmers and feed-back sessions, enhance the usefulness of the seed bank.

(DTE 15/12/2001)

Nature, The Best Farmer

Mini Pant Zacharia

When all eyes gaze skyward for the monsoons, a few farmers in Maharashtra and Gujarat stay unperturbed. They await rains but their orchards and farms are not entirely at the mercy of monsoon. The natural farming method they have adopted needs minimum water. So, even if the monsoon fails, it will not set a debt trap.

Consider for instance the water they need – 15 litres per annum for a single fruit tree. Compare this to the 140 litres needed in the flood field system. Even in the drip irrigation system, which perhaps is the most economical, a single tree requires 60 litres of water, - four times as much as natural farming.

And compare this to their production average yield of coconut per tree is 400 fruits as against the 200 fruits yield reported from Kerala through modern farming methods. More importantly, the fruits and vegetables thus grown are more nutritious and mercifully lacking in chemical residues, which come with excessive use of pesticides and insecticides in modern farming.

Ashok Sanghvi of the Sanghvi farms, Umbergaon, Gujarat, who is promoting the idea of natural farming by Bhaskar Save's method for the past four years, is driven by the idea of converting the wastelands into green havens through the inexpensive and certain method of natural farming. "We are willing to take it up as a challenge to green the wastelands, and at no cost. All we ask is that the Government give us a chance to prove it". He had put forth this idea at the National Wasteland Development Seminar, held in Bombay in June First week 1993.

Ashok Sanghvi

Of the 130 million hectaresof wasteland in the country, 100 million is non-forest land and 30 million degraded wasteland. "Imagine the benefits of greening this land. Imagine the amount of greenery, forest produce and employment

that can be generated by developing these lands," is his earnest plea.

One may be skeptical, but he claims he can grow grass in barren land within four months and make it as fertile as any in four years. "It is not magic but simple principles of natural farming", he says. And what is this method?" No inorganic fertilizers, no chemical pesticides, no hybrid varieties of seeds, no tilling and no gallons and gallons of water", says the admirer and partner of 73-year-old farmer from Umbergaon, Bhaskar Save.

Save, who was one of the initial converts to the modern method of farming in post-independence India, found after a few years that land productivity declined with the use of chemical fertilizers. He experimented with the traditional farming methods, slowly switching over to organic farming. Termed a mad-man then, Save is today recognised for pioneering organic farming in the country and was recently honoured with the "Person of the Year" award by the Limca Book of Records.

Bhaskar Save's method works on the principle of live and let live in other words, farming with minimum interference in the ways of Nature. Thus, weeds, considered biggest enemy of crops in modern farming, are a blessing, and the use of chemical fertilizers an interference.

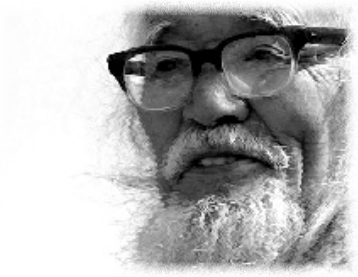
Tractors have no place in natural farming after the initial tilling and levelling of land, as they compress the soil preventing air and water circulation. Earthworms are the Nature's best tillers. Use of pesticide is anathema because it kills not only the pests but also the many organisms which are beneficial for the plants.

Water and manure are not given directly to the plants but used to enrich the soil in the surrounding areas. So platform and trenching method are used to water the plants at a distance of about 16 feet and supply manure. Because chemical fertilizers are not used, the water consumption of these plants is drastically reduced.

Bhaskar Save

The concept of natural farming is finding favour with many, especially the educated cultivators. Sanghvi farm which conducts free lectures and demonstrations on the natural farming methods, receives queries from a variety of people. Col. K.C. Chengappa from Pune, who plans to settle down with a farm in Mysore wishes to adopt the method. So does surgeon Kashinath Sobti from Bombay who has two acres of land in Karjat. "I read a book by Japanese author Masanobu Fukuoka, the guru of natural farming, and started experimenting on my land but failed miserably because the methods did not apply to Indian conditions." Just back from Bhaskar Save's farm and suitably impressed, he plans to

not only take up organic farming but also spread it among the farmers on land adjoining his.



Fukuoka

Only a score or so farmers in the country are cultivating grains, fruits and vegetables based on organic farming like Narayan Reddy from Varthur (Bangalore), P.D. Bapna from Dahanu (Maharashtra) and Mahendra Bhatt and Badribhai Joshi from district Broach in Gujarat.

Though the developed countries have woken up to the perils of excessive use of chemicals on food, the awareness is sadly lacking in the country. However, among city-dwellers there is an increasing awareness about the harmful effects of the pesticides and chemicals. This small but growing number is willing to pay an extra price to get goods, which are free from the harmful side-effects of the pesticides and chemicals.

Health food joints, which started as an elitist concept in Bombay in the late '80s, are catching up among the informed middle class now.

Vardhaman Sanskrit Dham, (VSD) one such centre near Opera house in Bombay, which started less than two years ago, is promoting the cause of organic farming. Wheat, rice, bajra, sugar, gur, fruits like sapota (chickoo), mangoes, papaya and vegetables bought from cultivators from Dahanu and neighbouring Gujarat are sold by the VSD.

Says Anil Shah, owner of the VSD, "There is a great market for organically grown food in Bombay. The higher income group Jain community which comprises 50 percent of my clientele is willing to pay a few rupees more to get food which is healthy, nutritious and tasty."

Many of the buyers at the VSD are scientists from BARC and doctors and lawyers. "They know the dangers of consuming the food grown by chemical means," says Anil.

With present sales standing at Rs.4 lakhs per annum, VSD plans to expand its services in the suburbs.

"Many farmers from the adjoining areas are willing to supply organically grown fruits and vegetables if we can create a market for such products in the city," he says. To those of us who buy contaminated food for want of an option there may still be hope.

** Extracts from the Articles

Traditional Wisdom of Weather Prediction

Jin Downing

Gujarat Agriculture University, its Professor P.R.Kanani and his NGO, Varsha Vigyan Mandal have been collecting, researching and verifying the Gujarat's local oral texts, written texts in Gujarati and Sanskrit, sayings in religious places, etc. on weather prediction. Rainfed crops are very reliant on the weather and a few days of delay may wipe out a farmer's entire season's crop. Prediction of the amount of rain is also an important factor in choosing what crop to sow.

In 1990, the Meteorology department has predicted normal monsoon. But locally known complete Bhadli's couplets (as these are called) said, "If there is rain with lightening and roaring of clouds on the second day of the month of Jeyestha (May-June) there will be no rain for the next 72 days. And in 1990 on the second of Jyeshtha (4.6.1990) there was such rain. 72 days later exactly on 15.8.1990 the rains came."

Brihad Samhita of Varahamihira says "that Monsoon will start 45 days after the peak flowering day of Indian Laburnum (Cassia). Evaluating a few frees, Kanani arrived at a mean date. The rains came 45 days thereafter.

There is the bear plant, whose strong growth in summer, predicts heavy rainfall in the ensuing monsoon season. The Keshuda, the flame of the forest, blooming early indicates early onset of the monsoon. The dense or light flowering also predicts heavy or light rain in the season to come. Thus laburnum gives the date and amount of rains to come.

Titodi-redwattled lapwing bird laying eggs also predicts the length of the monsoon. If four out of four eggs are turned upwards,

four months of good rains are predicted. Three eggs turning upward (out of four) indicate three rainy months. Wind direction on Holi festival day is another indicator.

The modern meteorologists dismiss the farmers' methods of rain prediction as nothing more than faith. But repeated analyses of predictions produce amazingly consistent patterns within tolerable limits of error.

**Reorganised from article 15.1.2002

The energy consumption of Building Materials:

1. Synthetic carpets 148 megajoules per kg (MJ)
2. Aluminum 227 MJ
3. Local Stone 0.79 M.J. 1 per Kg.
4. Brick 2.5 MJ/Kg
5. Plywood 10.4 MJ/Kg.
6. Glass 15.9 MJ/Kg
7. Steel 32 MJ/Kg
8. Zinc 51 MJ/Kg
9. PVC 70 MJ/Kg
10. Paint 93.3 MJ/Kg

A reinforced concrete multi-storyed building consumes the highest amount of energy. 4.21 GJ/sq metre. A load-bearing brick-building, two-storeyed uses 2.92 GJ/sqm which is 30% less. In sharp contrast, a two-storeyed-building using alternative materials such as stabilized mud block/walls (SMB). filler slab floors consumes only 161 GJ/Sqm and is (SMB) highly energy efficient.

Architects are carrying out many experiments with traditional materials in a bid to get out of the cement-steel frame. The materials are no way 'cheap' or compromising in the strength, convenience, aesthetic appeal, safety or utility of the structures built. The materials are 1. mud 2 clay 3 straw 4. stone 5. wood and bamboo.

(DTE 31.8.07)

An Ingenious Irrigation Technique

M.J.Prabu

In the coastal areas of Kerala, farmers have been using a simple indigenous technique called pitcher irrigation which greatly reduces the demand for water. Pitcher irrigation is cost-effective, farmer-friendly and easy to instal. It does not require any high-tech gadgets and needs no maintenance. It is ideal for small holdings (1-2 acres) and is suitable for growing vegetables. It is also suitable for coconuts and arecanuts at sapling stage. It consists of a clay pot with a cotton wick fixed at the bottom of the pot, and buried in the soil (upto its neck) and filled with water.

The natural pores in the pot allow the water to spread into the soil creating moisture for crop growth. The water can be filled when required, maintaining continuous water supply to the plants. Because of the wick, the water penetration to the roots of the plants in the soil is better. Water seepage from the pitcher depends upon the soil, plant type and climate vegetables require about 2500 pots per hectare and coconut seedlings only 170 pots per ha. Arecanuts need 440 pots per hectare.

Water saving is 90% compared to flood irrigation. Fertilizing becomes much more focussed because the fertilizers can be dissolved in the water. As water delivery is limited to the roots of crop-plants, weeds die out. The cost factors favour pitcher irrigation as against drop/sprinkler irrigation much less still is needed.Productivity has shown marked increase.

* Adapted

A Village that gives you a healthy clothing

The Sittilingi Valley of Dharmapuri District Tamil Nadu has a group of Tribal people living in 22 villages. The NGO, The Tribal Health Initative (THI) persuaded the tribals to cultivate organic cotton on their small parcels of land. The yield was better, there was more profit and the cotton makes harmless clothing. The tribals started with cotton and after seeing the benefits extended their organic cultivation to pulses, cereals, turmeric and chilli.

The THI came to know of the Organic shirts being exported to Europe to those users who are allergic to chemicals in their clothes.

The THI purchased the organic cotton, shifted the material to the Bharatiyar Spinning Mill in Tuticorin District. Spinning the cotton into 50's counts, the Tamil Nadu Cooperative for Textiles (Co-Optex) wove the yarn in its handlooms, making shirts, towels, bedsheets, bed spreads, pillow-covers, and hand-kerchiefs, all non-allergic.

The Co-optex markets the special clothes through its extensive network of sales outlets. Co-optex also has launched Aroma

Shirts and Reversible Shirts.

A fabric dyed in organic herbal colours is produced by Gandhigram Dindigul District. The clothes are reputed to have a soothening effect on the wearer. A Japanese buyer is taking them for their therapeutic effect on the mind.

Compiled

Soil Success
(A Hyderabad Farmer's Record)

K.Srinivas Reddy

A cost-effective technique to restore soil fertility without using fertilizers.

Chinthala Venkat Reddy wanted a cost-effective way to restore soil fertility without using fertilizers. His efforts have borne fruit and the farmer from Lothukunta is now waiting for a patent for his technique.

Mr.Reddy's organic farm on the outskirts of the city has had a record paddy yield of 10.31 tonnes a hectare, compared to the average of around 6 tonnes. Breaking another record, he got the highest wheat yield of 5.60 tonnes a hectare.

With scientists from the Acharya N.G.Ranga Agricultural University (ANGRAU) and the Central Research Institute for Dryland Agriculture (CRIDA) certifying the efficacy of his technique, Mr.Reddy has applied for a patent with the help of the A.P.Technology and Development Promotion Centre. His technique is based on the principle that the topsoil layer needs to be tackled for 'depletion'. Farmers usually seek to do this by using fertilizers, which further depletes the soil. So, Mr.Reddy replaced the topsoil with soil from a depth of 4 feet.

He first experimented with it on an one-hectare field. A trench of 2.5 feet was made and dug up to 4 feet. The topsoil was removed for up to 4 inches. This was used to fill the trench, while excavated loose soil was spread across the field, mixed with castor cake. The results were stunning. The paddy yield (BPT 5204 variety) was 10.31 tonnes. The following year he experimented with another paddy variety and got 11.84 tonnes. With wheat (Lok 1 variety), 5.60 tonnes was the record yield as against 3 tonnes. Mr. Reddy filed his claims before the Patent Cooperation Treaty, a body under the World Intellectual Property Organisation. The Vienna-based PCT referred the claim to the International Searching Authority for verification and certification. Word is that the ISA has accepted the results and that a final confirmation from the PCT will enable Mr. Reddy to file for a patent.

compiled*

Sane sanitation

Paul Calvert

Sewage disposal is a persistent problem for municipalities all over the world. Current centralised practices leave 95% of this waste untreated: Flushed away from our toilets, they make their way to rivers and waterbodies and pollute them miser–ably. But human excreta are not nasty stinking waste that has to be flushed out; it could be turned into a valuable resource with good management. That is the central premise of the book under review. Its author, Paul Calvert, proposes the ecosanitation (ecosan) method as a way out of the sewage predicament. Ecosan is based on the premise that waste management should be guided by the same principles used by the human body in discharging waste.

Calvert argues that since our body has separate arrangements to discharge faeces and urine, they should be managed in different ways as well. So, ecosan is premised on two different methods to deal with faeces and urine.

Calvert argues that because faeces contain pathogens, its makes sense to isolate them in small volumes, rather then flush them away — and unleash pathogens into water. The excreta can then be sanitised and used as compost. Urine, in contrast, is sterile liquid. Use it fresh on your plants or collect it for farms or forests. If all this has you cring–ing in revulsion, Calvert is quick with his reassurances. "The excreta in the ecosan toilets do not smell because they are immediately covered with dry ash, soil or lime", he writes.

Nifty sketches illustrate the short–comings of conventional sanitation and also show that there is a logical and sus–tainable alternative. This book is a wake up call to everyone engaged in urban, and rural development and planning. But will they find use for it?

** Extracts

SECTION - II

Water Green

Yes! Water is everybody's business

Water Green

SECTION - II

Water green

Prelude

Annapurna Duval: We customarily describe a spend-thrift as one who spends money as if it were water. Now water supply has become so scarce, that pundits predict wars for water.

Jnani Noval: Increasing population, greater needs for water, newer applications of water, shrinking water stocks, pollution of ground and surface-water and lack of structures for storing rain and run-off water, have combined to create a scenario where water is a most precious commodity but in terrible shortage. Neighbours fight for water. Adjacent villages, neighbouring districts, states with common catchment systems, countries with common rivers flowing through them, find water as the object of dispute. Industrial pollution and misapplication of water, add to the problem. They say use of plastic, and similar materials which prevent seepage, and hinder underground storage are related problems. Here again technology, funding agencies and the users will have to work together for the best results.

Leave the responsibility of water sharing to us.

Krish Phidol: Water can be the best community building bond. In our tradition, water-bodies have always attracted large gatherings of people. Establishing, repairing and running water-dispensing-systems bring merit (Punya) to the donor.

Jnani Noval: Yes. Some of our young men have, starting with group efforts at water-harvesting, rebuilt towns and villages, revived villages and have reversed the town-ward migration of people from

draught-hit villages. And the nation and world` have recognized the importance and relevance of their work.

Annapurna Duval: If you leave the responsibility of water sharing to us, we will ensure better policing, self-policing, stopping water- theft, prompt payment of water-taxes and just distribution of water.

Jnani Noval: Yes. Water is every–body's business, It is not the conservator's business or the governments' business. By relegating such responsibilities to others we succeed in creating vested interests. Water-operations, Pani – Panchayats have been successful in Western India. The users know how best to share water, prioritise its distribution.

Krish Phidol: But water has to be purified first.

Jnani Noval: Yes. Large scale users have started realizing that recycled water, water with different levels of purification can be used for various ordinary day-to-day purposes. Such work has been under-taken in I.I.T. Mumbai and National Security Guards headquarters at Gurgaon, Delhi.

Krish Phidol: I do not consider a grain of wheat or paddy as a single grain. It has consumed so much of my energy, labour, time and has utilized so much of our water resources.

Jnani Noval: There has been an increasing awareness among scientists and policy makers that a kilogram of grain embodies so much of water, so much of labour and productive energy. A grain from a rain-fed crop is a symbol of timely rain gifted by God and Nature. That is why saints who live on god-gifted alms are said to live by Akasha-Vritti. (Yadruchcha labha santushtha:) In modern commerce, the grain markets have been rightly interpreted as traders in embodied energy. And of course, there are direct water-uses such as drinking and cooking which require high levels of cleanliness. In modern scientific methods various techniques are being tried. Unfortunately desalination and other water-distilling methods consume so much energy that they are inappropriate for large scale uses.

Annapurna Duval: When we do not utilize the existing supplies, diligently and equitably, increasing the supply will only add to our profligacy. We should bring home to our people the awareness of the preciousness of water and teach them to use water most efficiently in agriculture and at home.

Jnani Noval: Only then can water become a community – building tool.

Protecting an increasingly scarce resource

Ban Ki-moon

At the United Nations, 22nd March is World Water Day. We don't expect people to stop what they are doing and observe a moment of silence—but maybe they should. Every 20 seconds, a child dies from diseases associated with a lack of clean water. That adds up to an unconscionable 1.5 million young lives cut short each year.

More than two and a half billion people in the world live in the most abysmal standards of hygiene and sanitation. Helping them would do more than reduce the death toll; it would serve to protect the environment, alleviate poverty and promote development. That's because water underpins so much of the work we do in these areas.

Water is essential for survival. Unlike oil, there are no substitutes. But today, fresh water resources are stretched thin. Population growth will make the problem worse. So will climate change. As the global economy grows, so will its thirst.

Risk of conflict

As with oil, problems that grow from the scarcity of a vital resource tend to spill over borders. International Alert has identified 46 countries, home to 2.7 billion people, where climate change and water-related crises create a high risk of violent conflict. A further 56 countries, representing another 1.2 billion people, are at high risk of political instability. That's more than half the world.

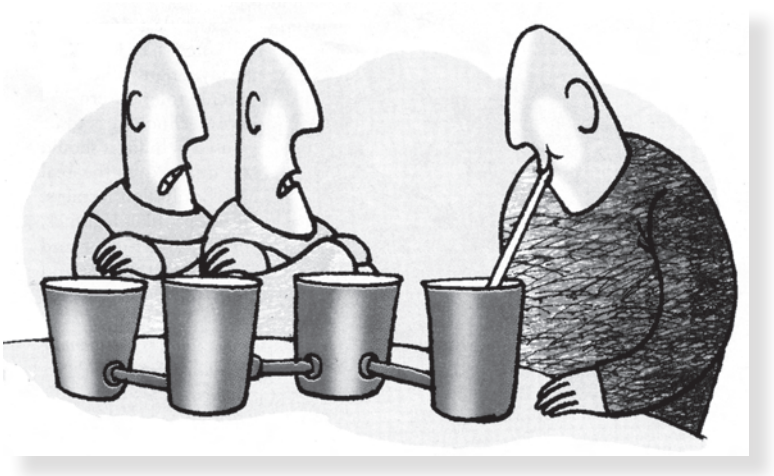
This is not an issue of rich or poor, north or south. China is diverting hundreds of millions

India contributes 17% to the global population, the people in India contribute only 13% to the global footprint.

of cubic metres of water to drought-prone Beijing ahead of the Olympics, but shortages are expected to persist for years to come. In North America, the mighty Colorado river seldom reaches the sea. Water stress affects one-third of the United States and one-fifth of Spain.

Depleting river waters

The water system of Lake Chad, in central Africa, supports some 30 million people. Yet over the past 30 years, it has shrunk to one-tenth of its former size, thanks to drought, climate change, mismanagement and overuse. Visiting Brazil this fall, I had to cancel a trip down a major tributary of the Amazon. It had dried up.



I have spent the past year beating the drum on climate change. We've seen the results in the "Bali road map," which charts a course for negotiations on a legally binding treaty limiting greenhouse gas emissions to take over when the Kyoto Protocol expires in 2012.

This year, I will make a similar effort to raise public awareness of the Millennium Development Goals (MDG).

Among other things, the so-called MDGs set a target of cutting by half the number of people without safe access to water by 2015. This is critically important. When you look at the health and development challenges faced by the poorest of the world's population – diseases like malaria or TB, rising food prices, environmental degradation – the common denominator often turns out to be water.

Evolving better strategies

This September, I will gather top-level officials from across the world at a summit in New York on how to reach the Goals, particularly in Africa. In the meantime, we need to begin thinking about better strategies for managing water—for using it efficiently and sharing it fairly. This means partnerships involving not just governments but civil society groups, individuals and businesses.

We are in the early stages of this awakening. But there are some encouraging signs, especially in the private sector. Corporations have long been viewed as culprits. The smokestacks from power plants pollute

our air, the effluents from industry spoil our rivers. But this is changing. More and more today, businesses are working to become part of the solution, rather than the problem.

Corporate commitment

Earlier this month, members of the UN Global Compact, the world's largest voluntary corporate citizenship initiative, gathered in New York for a meeting on water. The companies in that room had a total worth of about half a trillion dollars with employees in some 200 countries. The main theme: moving beyond the mere use of water to stewardship. This translates into a commitment to engage with the United Nations, governments and civil groups to protect what is becoming an increasingly scarce resource and ensure that local communities benefit.

Every journey is comprised of myriad small steps, and they spoke about those, too. A major textiles company told (us) how it was working with local governments and farmers to conserve watersheds in growing cotton. A jeans designer is planning to change its labels, calling for washing in cold and hanging dry as a step to save water. A drop in the bucket, yes. But I see it as the first wave in a tide of change.

(Courtesy: U.N.Information Centre, New Delhi.)

(The writer is Secretary-General of the United Nations)

The importance of the Himalayas

Prakash Rao

The Himalayan region has the largest concentration of glaciers outside the polar caps. It has a glacier coverage of 33,000 sq. km. This region is aptly called the "Water Tower of Asia". It provides 86 million cubic metres of waters annually. The Himalayan glaciers feed seven of Asia's great rivers 1. The Ganga 2. The Sindhu 3. The Brahmaputra 4. The Salveen (China and Mynmar) 5. The Mekong 6. The Yangtze and 7. The Huang Ho. They ensure a year-round water supply to about one billion people.

Inventories show that there are 5000-6000 glaciers in the Indian part of the Himalayas.

Water is a Community Building Tool

Uma Maheshwari & Esha Shaw

Indians are all of a Rain Indian Tribe. They worship water, conserve water, save water and use water in a most ingeneous way. They store it in hundreds of thousands and thousands of small reservoirs. Our economic, efficient and decentralized methods of water conservation reduced damage from flash floods, allowed for more percolation, built up soil moisture and greater greenery, reduced soil/land erosion, maintained atmospheric humidity regime.

These water-storage-systems are not always natural depressions where water stagnates. They are for a very large part, man-made lakes. The streams and rivers have been carefully trained to feed these lakes as well as the lands adjacent.

Smaller water-reservoirs scattered over the whole water-shed may be a better technological choice. The percentage water stored was much higher than in the costly dams. The side-effects were absent.

Inter-cropping and crop rotation between wet or dry crops are even now widely practised.

A typical Indian village is surrounded by wet lands and drylands, gardens, pastures and forests, ponds and lakes if not rivers and streams.

A wide variety of water-control structures and water-management practices are to be encountered in India, which reflect a fine tuning between terrain, soil, climate factors, water availability and crops.

A most important water control structure is the dam. In India, a weir which is now called the Grand Anicut was built across the Kaveri in the second century AD by Karikal Chola. It was improved by the British and is functioning even today. The numerous tanks to be found all over India are essentially dams of smaller height. They have stood for centuries and are operational even today.

A fine canal system supplemented the dams/lakes. Indigenous irrigation systems were often large complex webs involving several user-communities living in different villages. The state interested in its revenue, irrigated lands yielding higher taxes than dry lands. The State, concessions, spiritual merit, all drove people to undertake

construction of water tanks. Individual initiatives and local communities combined to build and maintain water-storages.

Village communities enjoyed wide ranging powers in relation to their common property resources, like forests, waste-lands, pastures and water-bodies. South Indian inscriptions record, the purchase and sale of (a) entire tank-systems including tank, ayacut, and foreshore (b) shares of water from other village bodies, (c) shares of fisheries (d) all kinds of land to raise funds for various purposes relating to the tank. They were also empowered to levy various cesses and to grant exemptions from taxes and dues.

A long tradition of farmers-associations for the construction and maintenance of water works exists all over India. They were referred to as Panchayats, Nattamai, Kaval-maniyam, nir-maniam, oppidisangam etc. Erivariayams (Tank-committees) and Eri merai (tank dues) are mentioned in the historical records of Tamil Nadu.

From small informal groups involving few families, to large representative bodies, farmers' associtions for water managements vary in size and structure. These farmers' associations decide upon and execute the allocation or distribution of water in the ayacut, organize repairs and maintenance and settle disputes between ayacutdars. They appoint and supervise irrigation functionaries, collect funds for maintenance work, organize that work, hear complaints from farmers and settle them. They built consensus among ayacutdars and functioned efficiently and smoothly.

During the British period, the village commons became the government properties. The villagers lost interest in their maintenance. The village lost its financial powers related to water bodies. Hereditary village officers were made government servants. The villagers lost their control over the water-distribution-mechanisms and the personnel distributing water. The system failed.

Expansion of private water sources of irrigation, like wells, tube-wells and bore-wells did away with the commons. A well-owner doing his own thing, does not have to cooperate, adjust or accommodate with other

farmers.

Irrigation functionaries

A set of irrigation functionaries to look after the day-to-day functioning of the irrigation systems of water tank, have been in existence for long in India. They irrigate the fields according to the instructions of the farmer's-associations. They hold their jobs hereditarily and may not have lands of their own, thus leaving their services impartial without personal stakes. The irrigator called Neerkatti in Tamil Nadu, would collect the farmers for the pre-monsoon desilting operations of canals and tanks. He also would irrigate the fields and receive a portion of the harvest from each farmer as his compensation. In Karnataka, women have entered this difficult job are and reported to have done well in their responsibility.

Indigenous Irrigation Engineers

To survey the area, to plan the dam-tank, to build it and maintain it, are all tasks, which would require extensive knowledge in civil engineering. Not only specialist engineers, specialist labourers were also available in the society in India. The non-technical labour was contributed voluntarily by the farmers themselves. The system was called Kudi Maramathu. The irrigation work was to a great extent run by a non-monetised economy in the pre-British India. Such a vital sector could not be left to the paid employees.

Gift of land, gift of gold, money, paddy and other endowments, tax concessions for donors, were known to have motivated the philanthropic work of providing water.

Irrigation was done by a fine trade-off between equity and efficiency: In water-rich years, the irrigation would start with the head (field nearer to the storage) and proceed towards the tail. The tail-enders would receive seepage water plus surface flow. In the years of water deficiency, the supply would start from the tail! Equity was

established within and across kingroups and caste-groups. The farmers' association would advise the individuals what to sow, based on water availability.

If water is the warp of the fabric of the society, water deities, temple tanks and

water festivals became its weft.

Storing Water and Traditional Indian Engineering

Nearly 25 million hectares of land is under the influence of storage works such as lakes and tanks, in the form of catchment submergence and command area. Although all storage works indirectly improve soil moisture, and induce deep percolation to ground water-table, some of them like khadin in Rajasthan, Bundhies in Madhya Pradesh are exclusively for increasing moisture in the soil profile. Rapat in Rajasthan is a structure which induces ground-water recharge.

Approximately 1. 3 million hectares of area is served by storage works, meant for soil moisture improvement.

Flow and lift irrigation systems, and 1. Tankard-pond-irrigation systems 2. Inundation irrigation systems 3. In-situ storage systems are known. Tanks and pond system can be subdivided into above-surface-storage and sub-surface-storage.

Efficient usage of slopes gradient, taking advantage of the general topography, arranging a series of storage tanks (chain-tanks), properly arranged components of the tank 1. Catchments area 2. Submergence area 3. Bund 4. Waste weir 5. Sluice 6. Distribution systems and 7. Command area speak highly of local wisdom in water harvesting and usage.

The major problems such as siltation, salinity ingress, evaporation-loss and absorption, were tackled with cost efficiency.

Water was diverted from rivers into irrigation-canals through checks in the river bed or by draining off excess flood water.

Water conservation through roof-water collection, surface-water-collection and subsurface water-collection varied from terrain to terrain, soil to soil.

Simple water-purification methods were adopted using locally available earthern pots, sand, charcoal etc. Some plants were also used as disinfectants.

The floods were controlled by 1) Combination of irrigation and drainage 2) Diversion structures leading, to storages.

The Kaveri systems ingeneously combines irrigation and drainage of floods. The Elas (valley-bases interlocked with hillocks) of Kerala take advantages of silt and nutrients flowing down the hillocks. The 2000 years old overflow irrigation systems of Bengal employ broad, shallow parallel canals with breachable mud banks to use flood water for irrigation.

The systems all have amazing technical sophistication.

(Water Management Traditions in India, PPST Foundation, Chennai)

Central American cattle raiser destroys two million hectares of forest land for establishing artificial grasslands - to cater to the beef market of North American fast food industry.

What Rural Folk Need Is Motivation

S.Rajendran

Introduction

V.B. Salunke, a 58-year old social worker, started mobilizing villagers towards community participation in the management of natural resources in 1972. The founder of the Pune-based NGO, Gram Gaurav Pratishthan, he developed the system of pani panchayats, or water management, through community participation, which, in 1981, the Planning Commission recommended for use in the drought-prone areas of the country.

His work, which has extended to more than 30 villages (including some in tribal areas) in Maharashtra, has got him many awards, including the Jamnalal Bajaj Award in 1986. Salunke speaks to you about his experiences with farmers. (Shri Salunke passed away in the year 2002)

What is the basic concept of Pani Panchayats?

Pani panchayats are arrangements between the farmers of a village to share water resources. There is a limit on the amount of land that can be irrigated-0.2 ha for an individual and 1 ha for a family. The beneficiaries should chip in 20 per cent of the capital cost. The Gram Gaurav Pratishthan provides the remainder as an interest free loan. The farmers are encouraged to manage and operate the scheme.

We try to bring more seasonal crops under irrigation and discourage the farming of water-guzzling crops. Even landless labourers get an equal share of the water. This provides employment and helps prevent migration.

What made you start it?

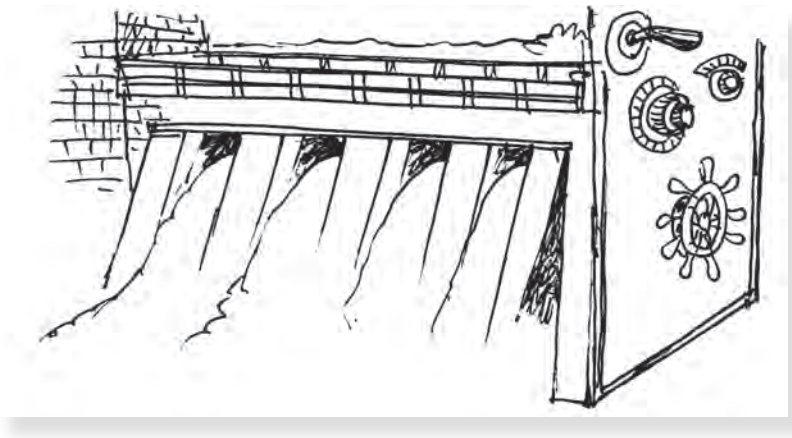
In 1972, Maharashtra was reeling under a severe drought. I visited some villages in Pune district where the drought had decimated the domestic animal population. Villagers, including big farmers, had to migrate and take up jobs in quarries. At that time, we decided to do something to improve water resource management at the village level. Two years later, we started the first pani panchayat in Naegaon village in Pune district.

How did you mobilize the local people?

Rural folk are generally intelligent and hardworking, but they are unorganized. What they need is motivation. Once they are rightly motivated, organized and guided, one can successfully implement water management measures through community participation. Initially, we held discussions with the villagers. Later, we explained the principles of pani panchayat. If the farmers agreed, we would survey the area and start the project. Usually, only a small section would come forward initially. But many more joined once the increase in productivity became evident.

What do you think of major irrigation projects?

I am for major irrigation schemes because they are multipurpose projects. But I am not convinced about the way the projects are executed, the manner in which water is distributed and used. It is a piecemeal approach. The administrators think that their job is over once the project is completed. They are not bothered about the proper distribution and utilization of water. Water is a common property resource and has to be shared equally by the community. But under the present system, farmers in the upper reaches are plagued by crop failures because of water-logging, while those in the lower reaches suffer from water shortage.



Also, the target-oriented nature of major projects goes against the concept of equitable water use. Even among farmers, there is no rational utilization of water because, in most of the command areas, the flood irrigation system is used. It not only affects crop production but also soil fertility and distribution of income.

But there are government schemes like watershed development programmes for irrigation management.....

Undoubtedly. But most of them are target-oriented and ultimately even the target groups hardly benefit from them. For instance, in one tribal village, the Public Works Department (PWD) constructed a dam at the cost of Rs.7 lakhs. However, even after 5 years, none of the farmers used even a drop of water from the dam for irrigation. The poor tribal farmers were under the impression that they should not use the water from the dam, as it was owned by the government. The farmers have been suffering from a paucity of water for irrigation, even as water from the dam goes waste. In another tribal village, a drainage

system constructed by the government does not carry even a drop of water.

What is the alternative?

Instead of targeting reservoirs, dams and canals, all villages should be given minimal support for managing minor irrigation schemes on a micro- watershed basis. The emphasis should be on total agricultural development.

For irrigation experts and planners, small irrigation projects or watershed schemes are like drops of water in the ocean. They always plan projects involving large amounts of money to irrigate millions of hectares and do not take into account the consequences.

Can you elaborate?

For balanced agricultural development, land, water and forest resources should be considered in tandem. It is not possible to irrigate the entire land available in a given area. Therefore, about 30 per cent of the land should be brought under irrigation, 30 per cent under forests and the remaining under rainfed farming. This model will mitigate shortages of food, fodder and fuel. This system is better than taking the different aspects of rural development in isolation. It is possible to develop a watershed programme in each village through community participation.

What is the potential of a watershed programme developed through people's participation?

If there is effective community participation, micro-level watershed programmes are economical, feasible and more in line with the needs of the local community.

In Maharashtra, about 60 per cent of the water from the major projects is used for irrigating the water-guzzling sugar cane crop, which is cultivated in just 3 per cent of the cropped area. If the same water is provided for the cultivation of cereals, pulses and oilseeds, there may not be a shortage in food supply. Besides, collective decisions have to be taken on crop selection and water management.

Non-governmental organizations (NGOs) have a major role to play in achieving these ends, as government agencies often plan and implement their programmes without consulting or seeking the cooperation of the local communities. Making the community participate in the process of decision-making, planning and implementation of irrigation management schemes not only results in the efficient use of water and other resources, but also brings about a feeling of community ownership.

How do farmers participate in such community projects?

Before the project is undertaken, the potential of land, water and other resources is explained. Participants are asked to contribute their labour for digging channels, wells and pipelines. Later, the farmers are assured that they will be allowed to cultivate equal areas of land. Besides, the farmers themselves irrigate the crop. They are discouraged from cultivating water- guzzling crops like sugar cane and are advised to cultivate cereals, which are essential for subsistence. Only if the availability of water is more than that required for such crops, are the farmers allowed to cultivate other crops.

What lessons have you learnt from the community water management system and what are your future plans?

Water is an asset and only community participation can ensure effective management and equitable use of this precious resource. People urgently require water to irrigate their crops. Once the supply of water for irrigation is assured, the farmers will be willing to pay-back the loans given to them and also extend the area under cultivation. Once the project is accepted by the villagers, they volunteer their labour.

We have found that the farmers pick up many useful things as we interact closely with them. In the villages where our programme has been implemented, we demonstrated the techniques of crop selection, cultivation, and water and soil management. In the process, problems regarding fuel, vegetables, edible oil and other essentials were also discussed. Moreover, the sharing of knowledge and experiences became a reciprocal process.

Because of the success of the water management schemes and the appreciation that we have received from the non-tribal areas, we have now undertaken such projects in remote tribal areas. If these ventures are successful, water management schemes will be undertaken in many more tribal villages.

A Dream Come True

The people of several villages in Pune district of Maharashtra were a Helpless lot, until Vilasrao B. Salunke, a visionary, stepped in.

Kazimuddin Ahmed

Everything is picture-perfect in Mahur village, about 75 km from Pune in Maharashtra. Acres of marigold and lilies in full bloom, teak trees and a variety of crops conceal its unpleasant past. This huge tract in the Western Ghats was, till the mid-1970's, barren and untended. Even vast expanses of tended lands did not guarantee a harvest worth talking about. Then Vilasrao B Salunke, then a young engineer who owned a factory manufacturing precision instruments in Pune, stepped in.

With the help of the villagers, Salunke not only brought water to the parched lands, but also instilled confidence and the will to survive among the people. He set up Gram Gaurav Pratisthan (GGP), a voluntary organization, to prove a simple fact: success can be achieved with very little resources. Today, GGP is involved in 55 water harvesting projects in 25 villages of Pune.

The Genesis:

A severe drought hit Maharashtra in 1972. In Purandhar taluka (block), thousands of people had migrated to the cities, where survival was no less an ordeal. The government, as an alternative, employed thousands of people as stone-cutters.

Curiosity led the young engineer to the drought-prone areas. "I saw people breaking stones under the harsh rays of the Sun, but I could not understand the connection between the drought and stone-breaking," he says. Salunke went to the Commissioner of Pune with the query. The Commissioner failed to provide any answer. The same

question was put to the stone-cutters. He was met with blank stares.

Salunke then asked the villagers what they really needed. "The reply was 'water in the fields'," he says. The villagers said if rainwater is conserved, all problems would be solved. "They had the solution, but without resources, they said they were handicapped," says Salunke.

Says Laxman Kherkar, who has been involved with the watershed programme in the villages for 27 years. "The government did not have a solution to the irrigation problems because the villagers were never asked about possible solutions."

Salunke understood the whole problem. "There was land in plenty, but no water," says Salunke, adding, "I realized that if water conservation, distribution and usage is done wisely, every family here can be given water security – an essential ingredient for food security."

Salunke started with Naigaon village in Purandhar. He met the villagers and explained his conservation plan. "For the villagers, somebody approaching them to discuss their problems and solutions was unbelievable. They were only used to government officials imposing things on them," he says.

The villagers agreed to give 16 hectares (ha) of land, which belonged to the village temple, on a trial basis. In the first year, Salunke managed to get some 500 villagers to work on constructing check dams to conserve rainwater. To prevent erosion, trees were grown in this patch of land. He also acquired an additional 80 ha of land from the villagers.

Soon, the results began to show up. The first monsoon, though scanty, completely irrigated the 16-ha land but only half the area was used for cultivation of foodgrains. The crop yield increased 10-fold. "It is

then that we realized the importance of water. Even the government irrigation officials were surprised," says Kherkar. The groundwater table also started rising.

The Five Principles:

With the first experiment bearing fruit, the next task was to handover the rainwater harvesting project to the people themselves. "But, water being a scarce commodity, there was a problem in its distribution," says Salunke. To ensure that the project does not die, he formed water councils in the villages and made everybody a shareholder, and formulated the following five principles to help people retain what they developed:

Water distribution would not be done in terms of landholdings. There would be per capita distribution of water.
In times of scarcity, water would be given for the area that can be cultivated by the family members themselves without any outside help. Crops which require less water would be cultivated with the reserved water.

The people realized that landless villagers were also entitled to water. So to put their quota to best use, land-owners who had excess land gave it to them for cultivation.

Water rights were made non-transferable, that it, even if the owner decides to sell his land, he is not permitted to sell the water rights. Salunke asked the villagers to contribute 20 per cent of the cost of the project, the rest being paid by the government, to make them realize that it was their own resources they were conserving.

After the immense success of the first experiment, the movement spread to other villages. "Although we knew that conserving water was the only solution to our problems, we did not know how to do it nor did we have the resources," says Satyaram Gole of Mahur village. His village's story is also unique.


Vilasrao Salunkhe
'Pani Baba'

A dam was constructed near Mahur in 1972. Another big dam, Vir was built on the river near the village. But the villagers did not get any benefits from these projects. Through the villagers owned land, the lack of water forced them to work in the fields near the big dam as labourers.

Thus, when the villagers of Mahur heard about Naigaon's success story, they rushed to Salunke. After a discussion, they returned to collect Rs. 32,000 –20 per cent cost of the project. It took 30 people and six months to collect the amount.

The work commenced in the early 1980s. Today, a pump carries water to a well at the base of the Mahur highlands. Another pump carries the water to an elevation of

about 40 metres. Water pipes, altogether 1,585 metres in length, provide water for irrigation in the plains as well as the highlands.

More importantly, people who had migrated have started coming back to the village. Gole is one of them. He was earning Rs. 15-20 a day as a textile mill labourer in Mumbai, the State capital. "In 1982, labour strikes in the textile mills had begun. But for the watershed programme, we would have starved to death," he says. Now some villagers in Mahur earn Rs. 75,000 to Rs. 1,00,000 per annum.

Mahur and Naigaon are just two examples of GGP's success. Since 1972, when the project started, GGP has spent Rs. 6,00,000 on water harvesting projects, a fraction of what is spent on big projects. However, the results are equally good, if not better. Better still, there are no cases of corruption.

Institutional Development:

Committees are set up for the management of water resources. For every project, there is one group leader and five executive members. The rest of the villagers are made shareholders or members of the committee. All the groups together form the Pani panchayat (water council). The panchayat comprises 15,000 members at present.

While village groups meet regularly, the pani panchayat assembles only once a year. For emergency meetings, the groups can always approach the GGP. But, apart from counseling and providing technical guidance, the whole show is run by the villagers themselves.

As for Salunke, he is now working on several others projects in tribal areas, such as afforestation. Salunke's vision was to bring about a harmony between land, water and human beings. With the land filled with flowers, trees and crops, there is good reason to believe that the vision can come true.

"The government did not have a solution to the irrigation problems because the villagers were never asked about possible solutions".

** Extracts from the Article

Tarun Bharat Sangh and its Secretary-Rajendra Singh

Prolonged neglect of the environment and deforestation, were the nightmares of the rural people of Alwar District of Rajasthan. Degraded lands, droughts, poverty and loss of control over the common lands, stared in their faces. The young and able-bodied men migrated to faraway towns in search of jobs.

Lack of vegetation led to land degradation. Monsoon run-off washed away the topsoil. Crops failed regularly. Agriculture was fast becoming a thing of the past. Women had to walk long distances for mere pots of water.

The naked ranges of Aravallis looked ravaged. For years villages remained all women villages, with the men-folk working in faraway towns.

Grazing grounds dried up. Cattle perished in large numbers. Only 3% of all cultivable area was irrigated. 90% of the villagers were marginal farmers. Debt-traps imprisoned them. There was no difference between the landlord and landless. Everyone was poor. Economic and social degradation followed ecological destruction. Illiteracy stood at 85%. School attendance dwindled to 3%.

Low rainfall, 600 mm per year, with 500 mm in the monsoon, could not support much of agriculture. Mountain slopes could not support forests, agriculture or wildlife. Charcoal contractors, lumber buyers, log suppliers to new railways have all but finished off the mountain-slope forests in the first half of the century.

There was no groundwater recharge. Wells dried. Rivers, once the lifelines, became sand-streaked memories.

Ravines defaced the agricultural lands. Monsoons shrank from 101 days per year (in 1973) to mere 55 days in 1987. The groundwater level fell by 60 metres and the water table by 5-10 metres.

On 2.10.1985, Gandhi Jayanthi Day, the

Tarun Bharat Sangh (TBS) led by Rajendra Singh started working. A village-elder advised the group "Do not talk too much; dig tanks and build johads—you will get the results." (Johad is a water harvesting structure).

Guided by traditional wisdom and helped by no engineers, the TBS has built 3000 water-harvesting structures in 650 villages of the Alwar district of Rajasthan. Prosperity is returning to the villages. The five rivers of the region have started flowing perennially after decades of drought, a direct result of conserving water in johads. More water, better crops, better conditions of soil, health, education and a rich community life ensued. Migration numbers came down, improving community and family relations. For every 100 rupees invested in johads, economic production rose by 400 rupees approximately.

A 426 metre long damaged old johad was repaired. Dry wells in nearby villages had water seeping in them, after the next monsoon. Smaller johads are also being constructed. To stall the degradation of soil in the catchment area, the forests had to be protected, and regenerated. Soil erosion had to be halted. The TBS built not only johads, they also built consensus among the people of the villages on projects to be taken up on priority basis.

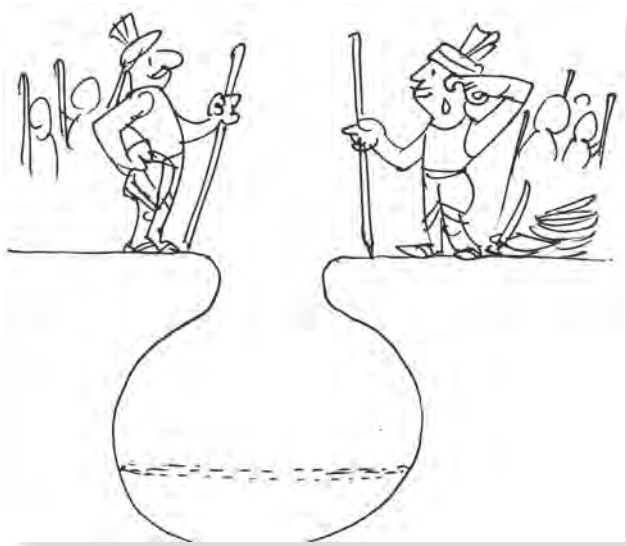
Spreading news of achievements through word of mouth, TBS involved more people, more villages. Annual Pani Yatras (water marches) bring more and more people within the aura of awareness.

In the beginning, the community participation was low, (30%) leaving the TBS volunteers to do much of the labour. But as the movement grew, the participation, involvement and experience grew too.

Qualified engineers and independent evaluators, inspected the structures and certified their strength, safety and structural viability. The structures have stood the test of time. Continued maintenance and protection call for social cohesion, alertness

and sustained sense of purpose. The johads caught not only the water that was running off, they caught too the beauty of spirits in different villages. Even migrants started returning in trickles.

Village councils (gram sabhas) were formed to take decisions, on sharing of resources generated and enforcement of social codes like ban on liquor consumption. All assets are owned by gram sabhas. TBS is only a facilitator. 6500 sq.km of land in 650 villages has been regenerated. The crude, formal and envious political resistance has been



overcome by the informal gram sabhas. The official sources have conceded now that the forest cover has risen to 40% from 1%—15 years ago. No less than 70% of land is under green cover. Birds have come back, wildlife has survived. Groundwater wealth has increased. Wells have come alive. Groundwater level went up by 6 metres.

Water became the focus of life and factor in social coherence. Food for work schemes were introduced. Self-reliance, cost-sharing, community participation, protection of grazing land and women's welfare have now become characteristcs of this area.

Dry rivers, five in number have become perennial. Milk production, business flow, productive and self-sustaining agriculture have brought about material prosperity. In some villages, 100% of agricultural lands have come back to the plough. Women participate in greater numbers in decision-making forums. School attendance has improved. New schools have come up. Crime rate has gone down. Education and health consciousness have crept in.

Sri Rajendra Singh has been awarded the prestigious Magsaysay award for his constructive work. This prize has thrown a number of political and government doors open for him and his movement.

Keeping them flowing all along

1. Introduction

All of us know of people who have rewritten history. But this man has rewritten the geo graphy of a region, and thus created history. A product of Jayaprakash Narayan's 'Total Revolution Movement', Rajendra Singh has come a long way from Daula village in Uttar Pradesh. He has taken upon himself the task of "disciplining" the use of water all over the country. And making dry rivers flow is only part of his mission. He is a Magsaysay awardee.

2. The formative years

He was called a 'nalayak' (a good-for-nothing fellow) by his father, a zamindar from Uttar Pradesh. But the fire to serve the people was burning in him since childhood. At the age of 13, while hearing JP at a public meeting, it was just an "emotional response" to the call for 'total revolution'. As he grew up, his association with several youth movements, of JP and Acharya Vinobha Bhave, kindled in him a desire to "do something". He organised youth groups for social change and to fight such social evils and untouchability. In 1975, he became part of the 'save democracy' movement against the emergency, but managed to evade arrest by going underground.

3. The tide turns

A significant turn in the life of Rajendra Singh came after the lifting of Emergency, with his posting as Project Officer, Adult Education Programme, in Jaipur. In 1984, he quit his job to work in rurual India and traveled to Kishori in Alwar district of Rajasthan. Initially, he organized health camps and encouraged children to attend school, but this did not have any impact on the people who had been suffering the pangs of having to live without water, then came an old tribal, Mangu, into his life, who insisted that the people of Gopalapura get water for their survival, instead of medicine and education. Rajendra Singh mobilised people, under a food-for-work programme, to create a huge pond, with a depth of 15 feet. To the delight of the villagers, the pond filled up when rain lashed the region. It was an occasion to celebrate: a feast was provided for relatives from nearby villages. This gave Rajendra Singh the impetus to start the now famous 'Tarun Bharat Sangh', which has resurrected the dead rivers and given life to thousands of people in Rajsthan.

4. The 'Culprit' turns a model

After 19 years, the Tarun Bharat Sangh has made 1058 Rajasthan villages 'drought-free" with community-managed water structures. In between, the Sangh facilitated the rebirth of the Ruparel river. The Rajsthan Government, which had slapped 377 cases on Rajendra Singh, re-classified 6,500 square kilometers of 'dark zone' into 'white zone'. The campaign undertaken by Rajendra Singh to involve people in the resurrection, management and disciplined use of water sources has had a cascading effect. The 'Rajasthan model' of rainwater harvesting is now adopted in Ramanathapuram.

Recalling his initial days with a nostalgic smile, Rajendra Singh says: "Sustainability is the real indicator of the Alwar programme. The engineering and technology came from the community, and we had visual impact and benefits." There have been attempts by the Government and MNCs to take over water sources. But he has foiled such attempts with the strength of the people. Those who deserted their villagers in search of greener pastures are back.

5. The Other Link

While rewriting geography, Rajendra Singh has ruralised the urbanites. The rainwater harvesting structures, inspired by Rajendra Singh, have withstood the severest of tests. "On September 3, 1996, there was a cloudburst, in which all government water structures broke down. Ours, made of 'country technology', suffered minor breaches." The Alwar district has been five drought years in succession, but it has a healthy ground water table.

Rajendra Singh is not happy with the present panchayat system for which the Government has refused to delegate adequate powers. "The system is still controlled by the Government and not the sarpanch. The Collector has powers to dismiss an elected president. This is not the 'gram swaraj' of Mahatma Gandhi," he says. The village panchayats, he feels, should involve the community in the maintenance of water sources. What is his message to the people? "Don't link rivers. Link the society."

* Extracts from the Article

The involvement of many agencies in the maintenance of tanks is the root cause for the degeneration and the people's role in maintenance of tanks should be improved. The National Rural Employment Guarantee Act (NREGA) which ensures assured employment, income as well as generation of rural capital should be implemented in reviving the system of tanks as it will bail us out from the tentacles of world financial institutions.

Preserve – Water

Hiware Bazar - Crisis to opportunity

Residents of Hiware Bazar, a village in Maharashtra's Ahmednagar district, have not forgotten their long jourey from a water scarce village to a surplus one. "Eking out a life from the village was practically unthinkable in 1970's-80 as water scarcity and land degradation made agriculture redundant," says Popatrao Pawar, the sarpanch of the village. Pawar's parents sent him to another village for pursuing study for the same reasons. Now, everybody boasts of the village's magical water conservation works that have resulted in extraordinary rise in local income.

At an average each of the village residents earns almost double of the country's average earning of top 10 percent of rural population. In the last 15 years the average income has gone up by 20 times. The forest here is well preserved; the fields are green and the residents happy. Living in the rain shadow area with less than 400 mm of rainfall per annum has its blessings, only when you know how to manage water.

Hiware Bazar defied law of drought

Hiware Bazar faced acute water crisis and severe land degradation during the 1970's. The village's traditional water storage systems were in ruins. People migrated in hordes due to constant crop failures in face of drought. From an important trade centre under the Maratha rulers, the village fell into economic ruin after the 1972 drought, one of the worst in the 20th century. In 1989-90, hardly 12 percent of the cultivable lands could be cultivated. Village's wells used to have water during the rainy season only.

In the 1980s, however, the youth of Hiware Bazar began to think about turning the wheel back into prosperity. The elections to local Panchayats in 1989 provided the right occasion. In search for a candidate. Pawar won unopposed. From here started the village's tryst with destiny. Pawar, inspired by the social activist Anna Hazare, took up water conservation works.

Make car pooling arrangements.

Many mutinies in Hiware Bazar

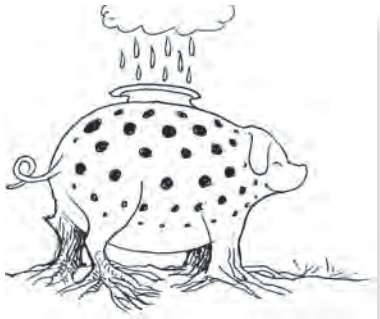
The village adopted an integrated model of development with water conservation as the core. In 1993, the District Social forestry Department helped Pawar in regenerating the completely degraded 70 ha of village forest, the catchments for the village wells. With local labour donation, the Panchayat constructed 420,000 contour trenches around the hills to conserve rainwater and recharging the groundwater. Residents took up massive plantation and forest regeneration activities immediately after the monsoon, many adjacent wells collected enough water to increase the irrigation areas from 20 ha to 70 ha the same year. "The village was just getting a bit of life back," remembers Pawar. In 1994, the Maharashtra government brought Hiware Bazar under the Adarsh Gaon Yojana(AGY), a scheme to replicate the success story of Ralegaon Siddhi scripted by Anna Hazare.

The village adopted five principles: ban on felling of trees, ban on free grazing, family planning, ban on liquor and voluntary labour participation. It formed a voluntary organization of its own – Yashwant Krishi Gram and Panlot Vikas Sanstha (Yashwant Agriculture Village and Watershed Development Trust) – to implement development works under the AGY. "Village and the government should be partners in development, but village must be in the driver's seat," explains Pawar. The village's strong and participatory institutional set up facilitated the initiatives. The Gram Sabha (village council) is the nodal institution that decides everything starting from identifying the site for a water harvesting structure to sharing of water and types of crops to be taken up with consensus.

During 1995-2005, the village invested all its development money on water conservation, both in recharging the groundwater as well as creating surface storage system. It laid a tight trap to catch rainwater. The 70 ha of forestation helped in treating the catchments for most of the wells, 414 ha of contour bunding stopped runoff and saved farms from silting up and around 660 water harvesting structures of various types captured rainwater. Since 2004, Hiware Bazar has been doing its annual water budgeting. Every year it measures its total water availability, estimates uses and then prescribes water uses through the Gram Sabha. The decisions of the Gram Sabha on water uses are binding on everybody.

Money rains

Hiware Bazar is now reaping economic harvests of water conservation. Grass production has gone up from 100 metric tonnes in 2000 to 1000 metric tonnes in 2004. This resulted in increased milk production from mere 150 litres per day during mid-1990s to 2200 litres per day now. The number of wells has increased from 97 to



217. Land under irrigation has gone up from 120 ha in 1999 to 260 ha in 2006.

In 2006 the income from agriculture alone was Rs.247, 84,000. This means a per capita agriculture income of Rs.1652/month. This is almost double of Rs.890/month income level for India's top earning 10 percent of rural population in 2004-05. As per 1992 below poverty line household survey, 168 families out of 226 were below poverty line (BPL). There are now only three BPL families.

Hiware Bazar's Message to India

Hiware Bazar, in many ways, symbolizes the problem of water management in the country. It also emerges as an example of how to fix the problem. The current water crisis in India is not about scarcity per se. As Hiware Bazar experience shows, it is about the management of water resources so that the infrastructure is capable of reaching out to poor people. A careful understanding of the initiative makes it evident that water management is not about technology, but about the manner of control and governance of the resource. It is about deepening democracy so that communities can be involved in the governance of the resource. Three-fourths of the irrigated area in the country use groundwater. Groundwater structures- dug wells, shallow and deep tube wells – have increased from 4 million in 1951 to 19 million now. Thus, there are as many decision makers, who constitute the irrigation entrepreneurs of the country. Hiware Bazar is an example of how to manage these multiple decision makers.

But even as groundwater has overtaken the surface water systems in terms of the acreage irrigated, what is of particular concern is that minor irrigation systems – tanks, ponds and all other community – based and decentralized water harvesting systems have simultaneously declined in importance. These systems played a critical role in the recharge of groundwater as they stored the monsoon rainwater, which then recharged underground aquifers. According to official estimates, poor maintenance, siltation and in particular, the complete disregard for the protection of the catchment areas of the tanks had meant that the area irrigated by tanks has declined from 3.6 million ha. in the 1950s to as little as 2.5 million ha. by 2000. During the same period, the area irrigated by wells – groundwater – surged from as little as 6 million ha to 36 million ha and more out of

a total irrigated area of 53 million ha.

This means that the ability of rural people to benefit from decentralized water structures has not only declined, but also it has seriously compromised the sustainability of groundwater irrigation. In the last decade, this loss of water bodies has continued. While the 2nd Minor Irrigation Census, conducted in the mid-1980s, counted 750,000 tanks and other surface water bodies, the next census enumerated only 556,000 such structures. This meant that there was even less recharge possibilities and groundwater extraction has thus become more unsustainable.

The simple fact is that the country has not learnt how it will build and maintain decentralized water systems, which in turn require decentralized governance. It is equally clear that technology choices and approaches for water management need change. Currently drinking water programmes fail because they plan for the pipe and not the water source. It is here that India must learn from Hiware Bazar, how people learnt to live both with the scarcity as well as the excesses of water.

(From a hand-out from Hiware Bazar)

Water Wealth!

Rain Fall varies from 1140 cm in Cherrapunj 300 cm in Mangalore to 20 cm in Jaisalmer. Most of the regions get their rain from the SW monsoon, some regions from NE monsoon. Duration of rainfall varies from 15 days a year to 2 months and 5 months. Variation of rainfall from year to year is 80% to 15% !!!!

But the intensity of rainfall does not vary much!
Intensity of rainfall is 20 mm perday in Mangalore, Jaisalmer, Bangalore or Mumbai! (Mean intensity of rainfall in the plains of W Europe and England is two millimeter.

Rainfall also occurs in heavy short spells of a few days or even few hours on an average of 300 hours or 12 ½ days throughout the year. Even out of the 300 hours, half the rain fall in less than 30 hours. For e.g. half of Mumbai's rainfall (100cm) occurs within 30 hours spread over a rainy season of 100 days.

Let's do some watery Maths

Radha H.S.

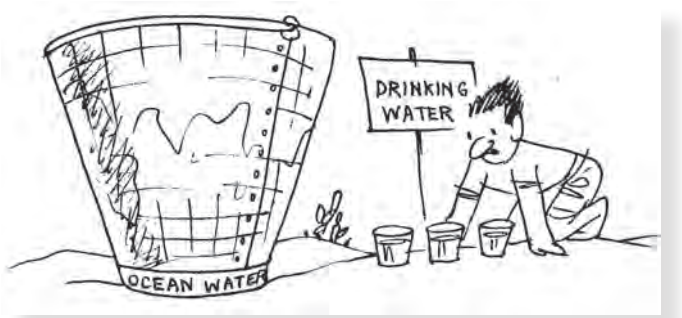
We hear talk of conserving water, see tankers delivering water, posters to save water, politicians talk of water sharing and parents say "Don't waste water".

We learn a fact at school – approximately 70 per cent of Earth is water. So where's the water?

- Oceans e.g. Indian Ocean (97.2 per cent)
- Meltdown from the polar ice caps and glaciers (2 per cent)
- Underground water eg. Borewells (0.62 per cent)
- Lakes eg. Ulsoor lake (0.009 per cent)
- Inland seas/lakes eg. Caspian sea (0.008 per cent)
- Water in our atmosphere (0.001 per cent)
- Rivers eg. Cauvery (0.0001 per cent)

Counting water

- To understand better, let's say all the water on Earth is in a bucket—about 100 cups.
- Pour out 97 cups into a plastic bag—ocean water.
- Two cups into another plastic bag – water if the polar ice-caps are melted.
- 3/5 of a cup into yet another plastic bag – underground water.
- Now there is little water left.



Let's do some watery Maths.

Counting out the salty water leaves people

less than three cups of drinking water!

Out of this, the polar ice caps are frozen and not available for immediate use. This leaves people on Earth less than one cup of available drinking water mostly from lakes, rivers and underground water.

Our watery Maths shows us how little drinking water there actually is on Earth in spite of it being covered by 70 per cent water. A lot of this is also polluted with industrial waste, sewage and so on.

Next time you drink water, imagine who else might have used the same water – elephants at Bandipur 1000 years ago, may be a giraffe in Africa 2000 years ago and may be ancestor chimpanzee drank this millions of years ago!

Silly and imaginary?

No. Earth has had the same water ever since it was formed. Scientists understand that water cannot leave the Earth. It just follows the Water Cycle – rain, flow into river or run into the Earth, join the ocean, evaporate, form a cloud and come back as rain.

But today the "available drinking water" has to be used by more number of people. Technology helps – polluted water can be cleaned, we can get drinking water from the oceans and even get water out of our atmosphere, but it's all expensive.

Instead, we could use less water and not pollute our water sources.

* Extracts from the Article 17.6.2008

Wet clothes

(New method of measuring 'water footprint' shows cotton is a guzzler)

Water footprint of a nation is the total freshwater used to produce goods and services for its entire population. It includes rainwater evaporated (green water), surface and groundwater (blue water) consumed and water needed to treat pollution created by production.

Cotton uses a lot of water in agriculture, processing and pollution ▼

Cotton crop
- Rainwater evaporated during crop growth **WATER DEPLETION**
- Surface and groundwater used **WATER DEPLETION**
- Leaching of chemical fertilisers and pesticides **POLLUTION**

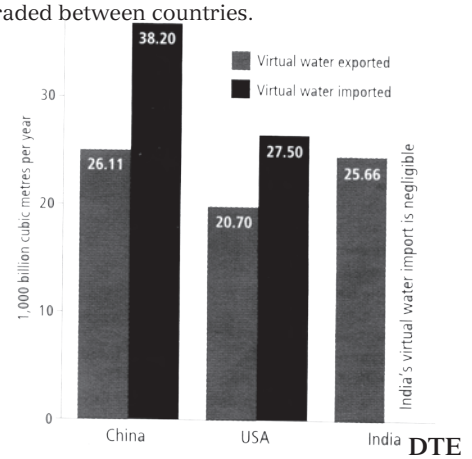
Cotton processing
- Water used for processing **WATER DEPLETION**
- Release of chemicals for bleach and dye **POLLUTION**

Cotton product

Virtual water is the total volume of water used to produce a commodity. It is also called 'embedded water'. The trade of any commodity means movement of virtual water along with the product

(a pair of jeans 1,000 gm) = **10,850 litres virtual water**

virtual water balance for cotton that is being traded between countries.



- A single bedsheet weighing 900 gm carries 9,750 litres of virtual water
- A T-shirt weighing 250 gms carries 2,720 litres of virtual water
- One diaper weighing 75 gms carries 810 litres of virtual water
- And a Johnson's cotton bud weighing just 0.33 gms carries 3.6 litres of virtual water

DTE

Water Users Associations of Maharashtra

Ruksam Boge

Many farmers of Maharashtra started water users cooperatives in around 1993. They were guided by NGOs such as Society for promoting participative Eco system and Samaj Parivartan Kendra. 346 Water Users Associations (WUA) have registered with a MOU with the government and 590 WUAs are unregistered ones. The total area under them is 4,71,153 hectares, the only redeeming feature of Maharashtras irrigation system. They buy water in bulk from the irrigation department, ensure equitable distribution and take care of its management.

The peculiar nature of canal irrigation means that cooperation between farmers is very critical for equitable distribution of canal water. This is because of the asymmetry caused by the location of fields along the canal and its branches. As water flows down from the head of a canal to its tail, it seeps, spills, evaporates and often, is illegally diverted. By the time it reaches the farmers at the tail end, there is little or no water left. Such inequities between people can only be resolved by a collective effort of farmers. The special features that make WUA's work are

1. Farmers themselves take charge
2. There is equitable distribution of water
3. Farmers at the tail get the first preference
4. The system is transparent and accountable
5. There is no water theft
6. There is no bribery or corruption
8. Efficiency in water use means more land can be tilled
9. The cropping pattern improves, with three crop-cycles in a year . It makes good economic sense
10. The farmers grow a variety a crops including water-intensive crops. Productivity has gone up.
11. WUAs collect the water-cess from individual farmers. This ensures high recovery rates for the irrigation department.

But unfortunately the Government department does not keep its end of the bargain.

** Extracted from the Article 31.5.2003

SECTION - III

Climate Change-Green Solutions

The global village has been well and truly set on fire with no fire-engines around

Climate Change-Green Solutions

SECTION - III

Climate Change - Green Solution

Prelude

Annapurna Duval: Having succeeded to a great extent in vandalizing the earth, now we have set our sights on the sky, the atmosphere and the higher reaches, it seems.

Krish Phidol: The rains fail, or fall when I want them the least, like the harvesting season. There are floods.

Jnani Noval: These are what you as a farmer see as matters of immediate consequence. There have been more problems, ozone depletion, global warming, melting of the ice-caps in the polar and mountainous regions, receding of glaciers, drying up of rivers. People living near the poles, have suffered skin diseases. Sea-levels rise flooding low-lying areas along the beaches.

Annapurna Duval: Are Scientists and Technologists doing something about all this?

Jnani Noval: We have to ask ourselves whether Technology will solve all our problems. There are people who say that inappropriate technology is the culprit that has caused global-warming. The measures suggested for facing the problem are adaptation and mitigation. Our people will have to be taught how to adapt to changes and this problem of climate change is going to be around for decades, even if we start today, taking the steps for mitigation. In the meantime pressure is building up in the atmosphere, impacting virtually all aspects of life. We have to learn our lessons.

Krish Phidol: Disasters are perhaps going to wait until we complete our panel discussions, blame-games and hair-splitting arguments.

Annapoorna Duval: Already we have lost six out of the seven temples to sea-incursions at Mahabalipuram.

Jnani Noval: Climate change is a border-

less problem. Everybody is going to suffer until everyone learns his/her lessons.

Krish Phidol: The global village has been well and truly set on fire with no fire-engines around.

Jnani Noval: There are no simple or quick-fix solutions. The habitual use of fossil-fuels in transport systems and chemical/petro products in fertilizers has been deeply ingrained in our minds. We cannot undo it in a day and put new systems in place.

Annapoorna Duval: But you scholars sounded so confident when you introduced new fertilizers just one generation ago and fossil-fuelled transport only two or three generations back. Your cures for our rustic stupidity were so simple! Now what prevents you from effecting simple reversals of your steps?

Jnani Noval: (Looking down) Apportioning blame is not going to solve problems. Tightening the belt in fossil-fuel emission, bracing ourselves to use more and more of

Fossil Fuel Emissions

renewable fuels, are needed urgently. There are people who would say "Do not blow up the size of the problems. The technology is already there; only the fuel is to be replaced. The Agro-bio-technology – has been set in place. Only ammonia and Phosphorus have to replaced by new chemicals."

Krish Phidol: No. Your mind-set has to change. Your solutions are like pumping Oxygen into a dead body to bring it back to life.

Jnani Noval: Our very ideas of energy and its applications in domestic and industrial appliances are changing. Nanotechnology and better instrument design, are some of the trends.

Annapoorna Duval: India has done some good work in the field of wind, gobargas and hydro-power sections. These resources enable us to go for decentralized production and compels the user to apply energy in a decentralized manner.

Jnani Noval: True. But the total energy needs are mind-boggling in their quantity.

Krish Phidol: How long are we going to postpone the application of life-energy, cattle-energy, human energy? These are the most renewable forms.

Jnani Noval: It is going to be very difficult to go back to pastoral life. There is going to be much suffering, frustration before man returns to Mother Earth's lap for a nature-friendly life-style.

Annapoorna Duval: Even simple elements of Nature are being bought and sold. Water has become a commodity to be traded. Some people, say the supply of animal draught-power, agriculture,

cattle-breeding all have improved after the introduction of industrial culture and market-culture. But God save me from these markets. The role of markets in improving the quality of life of animals and birds is illusory. I hear that in poultry farms the owners do not allow the birds to sleep, so that the chicks can be kept awake, made to eat more grains and would improve their body-weight.

We were talking about the trend of commodification of water, earth, energy, space and air!

Jnani Noval: As a side show-of Kyoto conference, there was a meet on the water - related problems as a facet of global warming. The scholars said that international grain-trade is actually camouflaged water-trade. When you buy or sell a kilogram of meat or grain, you trade in all the water that goes to produce the grain! Dominant traders persuade the poor producers to divert their water supply to cultivate the grain the buyer needs or feed the grain to cattle/poultry and sell meat. This ultimately affects the water supply of the producer – society and the global grain price.

Krish Phidol: As they do in the soft-drink industry! Let the farms dry so that townsmen can have fizzy drinks.

Jnani Noval: Yes. The man-power, land-wealth, water-wealth all can be pressed into producing what the buyer wants. For colonizing the poor countries, the invader need not go and sit there now. He can simply direct the production processes in the poor countries. And he can always claim that the employment opportunities have improved; that production and GDP have climbed the growth-ladder.

Krish Phidol: It will be interesting to watch what global warming does to society at large.

Jnani Noval: The disruptive effects on human settlements, human societies caused by global warming is being studied. They say sea-water inundating low-lying areas will dislocate nearly one third of the world's population. Climate change, disturbance of the weather-cycle, crop-cycle will impact food production. Regional disparities will show up as political consequences. Migration of human, animal population will reach unacceptable levels.

Annapoorna Duval: I am afraid warm days will make human beings more and more short – tempered. We will become quarrelsome, perhaps wage more wars.

Jnani Noval: Governments, voluntary bod-

ies, individuals and corporations are making valiant efforts to face the problems and adapt themselves to new times!

Annapoorna Duval: What is carbon credit – trading?

Jnani Noval: The industrialized countries pollute the air much more than other countries. The rich countries purchase fuels, oil-seeds that pollute the atmosphere less. The industrialized countries can use so much of fossil – fuel, if they use certain quantity of non-polluting or less polluting fuels, (renewable ones at that). The rich countries can also pay to the poor, non-polluting countries to buy-off their carbon-credits.

Krish Phidol: Hey Rama! We have a five thousand years old story of Yayati who tried to sell off his old-age and his senility to buy from his son some of the latter's youthfulness, so that Yayati can enjoy the sensual pleasures for a longer period. Your story is like that!

Jnani Noval: But pollution has no borders. Whether America burns fossil fuel or Spain purchases carbon-credit, the global warming cannot be stopped as long as burning of fossil fuel continues unabated any where in the world. The Earth as whole is a single entity suffering along with its inhabitants.

Annapoorna Duval: There is an old joke of a boatman trying to shift forward and backward the cargo in an overloaded boat. The boat sinks just because it is overloaded, not because of its imbalance! What is the ultimate solution to the problem? On our part we are also improving the agro-technology to reduce carbon-emissions, our diaries are recast to save carbon. Indian Scientists are discovering new refrigeration methods to save the ozone layer.

Jnani Noval: Simpler living, less travel, sharing auto-rides with fellow passengers, tightening the belt, substituting vegetable fuel, animal power, human hands for fossil-fuels, slowing down, taking more time to live, more time to love, interact with people, with nature! Embracing voluntary poverty.

Krish Phidol: Is there a technological scientific, or political or economic alternative to creating simple good human beings?

Jnani Noval: No! These perceived solutions can facilitate/help good human beings to face his problems. Technology *perse* cannot help unless man learns to tighten his belt! And learn to be good human beings!

Climate Change – What it means for India

Dr.Prakash Chandra Maithani

Introduction

1.1 Earth's climate system is anything but simple. Many factors influence it; from massive events on the sun to the growth of microscopic organisms in the oceans with subtle interactions among many of them. Earth's climate is experiencing a significant change characterized by surface temperature rise. A firm and ever-growing body of evidence points that this warming is mainly due to human activity. A major contributor is burning of hydrocarbons –coal,oil and gas-for energy purposes that leads to release of carbon-di-oxide and other related gases –known as green house gases (GHGs)-in the atmosphere. Global warming is occurring due to an increase in the concentration of atmospheric greenhouse gases.

1.2 The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC 2007), using existing body of knowledge has reinforced that global warming is mainly due to man-made emissions of greenhouse gases. Over the past 200 years, concentration of atmospheric carbon dioxide increased from a pre-industrial level of 278 parts per million to 379 parts per million in 2005 and during this period the average global temperature rose by 0.74° C. According to scientists, this temperature rise is the largest and quickest that has been witnessed in earth's history.

1.3 An increasing rate of warming has taken place particularly over the last 25 years

Nilgiris - Eastern Ghats reserve contains the largest single population of elephants in Asia (a minimum population of 6300 elephants).

and 11 of the 12 warmest years on record have occurred in the past 12 years. IPCC 2007 gives projections for the 21st century which show that global warming will continue unabated. Projections for 2100 range from a minimum rise in global average temperature of 1.8° C to as much as 4° C with the best estimates of 3° C.

1.4 Concentration of greenhouse gases in the range of 450-500 ppm should keep the global mean temperature increase between 2°C and 2.4°C, which is considered an adaptable limit.

1.5 As per IPCC 2007 one of the major impacts of global warming would be rise in sea levels between 0.18- 0.59 metres. Further, rainfall pattern is likely to be affected which in turn would lead to water shortages and/or flooding. Rising temperatures will also cause shifts in crop growing seasons, affecting food security. Changes in distribution of disease vectors putting more people at risk from diseases such as malaria and dengue fever are also predicted. Temperature increases will potentially increase rates of extinction for many habitats and species (up to 30 per cent with a 2° C rise in temperature). Even if stabilization of greenhouse gases is achieved, global warming will still continue for several decades and sea levels will continue to rise for several centuries.

2 Impact on India

2.1 Although India occupies 2.4 per cent of the world's geographical area, it supports 16.2 per cent of the global population. India's initial National Communication to the United Nations Framework Convention on Climate Change (2004) reveals that energy sector accounts for around 61 percent of total national emissions. Exploitation of natural resources associated with economic development has led to increase in pollution, land degradation, and other environmental concerns. Climate change represents a further stress and its impact, as per the country's National Communication are summarized hereinunder.

a) The hydrological cycle, a fundamental component of climate, is likely to be altered in important ways due to climate change. River basins of the Cauvery, Ganga, Narmada and Krishna are likely to experience seasonal or regular water stressed conditions.

b) Threat to livelihood of millions of small and marginal farmers in rainfed areas. Food security of India may be at risk in future due to the threat of climate change leading to increase in frequency and intensity of droughts and floods,

thereby affecting food production.

c) Enhanced levels of carbon-di-oxide are projected to adversely impact biodiversity, including forest resources. The impact on forests is likely to have adverse socio-economic implications for forest-dependent communities and the national economy.

d) Global warming is causing the melting of glaciers in the Himalayas. In the short term, this means increased risk of flooding, erosion, as melting of snow coincides with the summer monsoon season, any intensification of the monsoon and/or increase in melting is likely to contribute to flood disasters in Himalayan catchments. Increased snowmelt in the western Himalayas could bring larger quantities of fresh water into the Gangetic delta.

e) A rise in sea level is likely to have significant implications on the coastal population and agricultural performance of India. A one-metre sea level rise is projected to displace approximately 7.1 million people in India and about 5,764 square kilometers of land area will be lost, along with 4,200 km of roads.

f) It is projected that malaria will move to higher latitudes and altitudes in India, with 10 per cent more area offering climatic opportunities for the malaria vector to breed throughout the year during the 2080s with respect to the year 2000.

g) Increased temperatures would increase space-cooling requirements, while enhanced groundwater demand would increase water pumping requirements. These will enhance the electricity demand and add costs to the consumers for maintaining their lifestyles, as well as to the electricity production systems.

3. Global Response

3.1 The United Nations Framework Convention on Climate Change (UNFCCC), to which India is a Party, came into force in 1994 with the aim of stabilizing greenhouse gases in the atmosphere at a level that would prevent irreversible adverse changes in the climate system. Acknowledging the global nature of issue, UNFCCC has sought cooperation from countries and their participation in an effective and appropriate international response in accordance with their common but differentiated responsibilities and respective capabilities. The Kyoto Protocol (KP) of 1997

requires developed countries to reduce their greenhouse gas emissions by 5.2 percent of their 1990 levels by 2008-2012. KP does not impose emission reduction commitments on developing countries as it was recognized that the major contribution to mitigate climate change should come from developed countries which historically have been responsible for a bulk of GHGs.

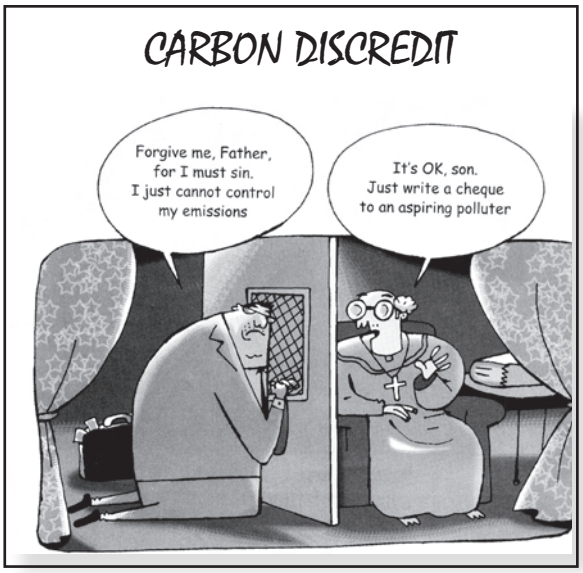
4. Greenhouse gas emissions

4.1 As per International Energy Agency (IEA), 26.9 billion tons of carbon-di-oxide equivalent emitted worldwide. United States had largest share followed by China, the European Union, Russia, Japan and India. However, per capita emissions data reveal a different picture as the emissions from US, Germany, Japan, UK, EU are far ahead than those of China and India as shown in Table below.

Carbon Foot Print of Selected Countries, 2004

Country or Region	Population (million)	CO_2 Emissions (million tons)	Emissions per Person (tons of CO_2)
United States	294	5,815	19.8
China	1,303	4,762	3.7
Russia	144	1,553	10.8
Japan	128	1,271	10.0
India	1,080	1,103	1.0
Germany	83	839	10.2
United Kingdom	60	542	9.1
France	62	386	6.2
Bangladesh	139	35	0.3
European Union (15 countries)	386	3,317	8.6
World	6,352	26,930	4.2

4.2 In spite of being legally binding, the KP has not turned out to be as effective as it was intended to be. As per UN statistics, from 2000 to 2005, the growth rate of carbon-di-oxide emissions was more than 2.5 percent per year, whereas in the 1990s it was less than 1percent per year. Despite incontrovertible and mounting evidence, developed countries are yet to develop a sound strategy to tackle the threat of climate change.



4.3 The first commitment period of KP (USA has not yet ratified KP) would be expiring in 2012. Discussions have started on post KP phase. In the thirteenth Conference of the Parties to the UNFCCC held in Bali, Indonesia in December 2007 an action plan to work out a long-term commitment was adopted and this process is planned to be completed by 2009. Although, the discussion process is in progress, trends indicate that the post 2012 regime will likely be more diverse and emission trading will be part of any regime.

5. Clean Development Mechanism

5.1 To lower the overall costs of achieving emissions reduction commitments KP introduced three 'flexibility mechanisms'. These mechanisms enable developed countries to access cost-effective opportunities to reduce emissions or to remove carbon from the atmosphere in other countries. Clean Development Mechanism (CDM) is one such mechanism that generates Certified Emission Reduction (CER) units through projects in developing countries. Developed countries could use these CERs, generally referred as carbon credits for meeting their emission reduction commitments. Projects that were begun after 1 January 2000 are eligible for generating CERs. It is essential that a CDM project meets the three criteria to qualify: a) must show real, measurable and long-term benefits related to the mitigation of climate change; b) must result in emission reductions that are "additional" to the baseline emissions that would occur in the absence of the project; and c) must contribute to sustainable development in the developing country, where the project occurs. It is the responsibility of the developing country to determine if a project satisfies sustainability criterion.

5.2 The CDM market has seen a steady growth. Due to its vast market potential for renewable energy projects, and a relatively well-developed industrial, financing and business infrastructure, India is perceived as an excellent country for developing Clean Development Mechanism (CDM) projects. As such, India has emerged as one of the most favoured destination for CDM projects globally, with renewable energy projects having the major share. By April 2008, with 881 projects, Indian CDM projects constitute around 28 percent of total projects and these projects are expected to generate around 37.3 mil-

lion carbon credits by 2012. Renewable energy projects constitute over 60 percent of total CDM projects. One of the prime interests of developing countries in CDM is its potential to facilitate the transfer of clean technologies, which unfortunately rarely happens.

6. India's Response to the Climate Change Mitigation

6.1 Although, India does not have any greenhouse gas abatement commitments under KP, it has a a range of policies and programs to help mitigate climate change. Some of these include: a) Development and application of renewable energy technologies; b) Improving energy efficiency and conservation as well as setting up of Bureau of Energy Efficiency; c) Promotion of clean coal technologies; d) Afforestation and conservation of forests; e) Reduction of gas flaring; f) Use of cleaner and lesser carbon intensive fuel for transport; and g) Encouraging Mass Rapid Transport Systems.

6.2 Around 64 per cent of the country's installed capacity of power is thermal (53 per cent coal; 10 per cent gas and 1 per cent oil), hydro 25.5 per cent, nuclear 3 per cent, and renewable energy 8 per cent. In order to meet GDP growth projection of 8 percent, it has been estimated that the country would need a massive increase in the installed capacity for electricity from 140,000 MW in 2008 to 780,000 MW by 2031-32. In this context development of renewable energy technologies is crucial for low carbon economy. Indian commitment for development and utilization of renewable energy was much before the global surge for renewables in the wake of climate change and other related concerns.

6.3 Renewable energy programme in India has evolved in three distinctive stages. The first stage, in 70s & early 80s towards capacity building and R&D; the second stage, from early 1980s to the end of the decade of large-scale demonstration and subsidy driven extension

activities; the third and current stage-emphasis on application of matured technologies for power generation and other biomass systems, as well as for industrial applications of solar and other forms of energy. By March 2008, renewable power excluding hydro above 25 MW installed capacity has reached over 11200 MW, contributing around 8 percent of the country's electric installed capacity, besides other application for cooking and heating purposes. Many of the programmes are directed

towards providing clean energy to rural communities for meeting their cooking, heating and motive power needs, apart from electricity. The plans for 2012 include achieving an installed capacity of around 25,000 MW grid power; installing additional 10 million sq meter solar thermal collector area, 2 million family type biogas plants and electrification of 10,000 remote villages and also directed focused research and development. Over the years, the share of renewable energy technologies is expected to further increase. However, this will depend upon the level of maturity of technology options, their affordability and accessibility.

6.4 Energy efficiency is another area of action. Energy efficiency of Indian industry has increased steadily over the years. Average specific energy consumption has been declining in the major energy-consuming industrial sectors, such as cement, steel, aluminum, fertilizers, etc. In the cement sector, the specific energy consumption of the most efficient plants is now comparable to that of the most efficient plants in the world.

6.5 In May 2007 an Energy Conservation Building Code (ECBC) was launched. It addresses the design of new, large commercial buildings to optimize the building's energy demand. Commercial buildings are one of the fastest growing sectors of the Indian economy, reflecting the increasing share of the services sector in the economy. This initiative is expected to introduce new building

concepts that will reduce overall energy demand in building.

7. Combating Climate Change – Pertinent Issues

7.1 The World Watch Institute Report 'State of the World 2008' has nicely summed up that the number of people on the planet and the way in which they live determines the impact of human society on the environment. Reducing the overall impact that people have on the environment can happen in only a limited number of ways: changing lifestyles, improving the efficiency of technology, or reducing the number of people on the planet. It estimates that if every one in the world lived the way US do, annual global carbon-dioxide emissions would be almost five times the current level by the middle of the century. Whereas the IPCC has estimated that the world needs to reduce global emissions by as much as 80 percent over 1990 level by 2050 if 'danger-

India has 597 Protected Areas comprising 95 National Parks, 500 Wildlife Sanctuaries 2 conservation reserves covering 1.56 million ha area or 4.75 per cent geographical area of the country.

ous anthropogenic climate change' is to be averted. It implies that the global emissions are below 5 gigatons and reducing the average carbon footprint to well under 1 ton per person, lower than it now is on average in India.

7.2 Accordingly, the major challenge, apart from building new energy systems and efficiency improvement, is changes in lifestyles and behavioral patterns that contribute to climate change mitigation across all sectors. Lifestyle changes can reduce greenhouse gas emissions. Changes in lifestyles and consumption patterns that emphasize resource conservation can contribute to developing a low-carbon economy that is both equitable and sustainable. Changes in behavior, cultural patterns and consumer choice and use of technologies can result in considerable reduction in carbon-di-oxide emissions (ref: IPCC). As such no de-carbonization efforts can succeed if patterns of production and consumption remain grossly unsustainable. These need to be catalogued and mainstreamed in all societies.

7.3 There is a need to reach an agreement on IPRs on technologies necessary for accelerated mitigation efforts in developing countries. Technologies are owned in commercial and private domain. Today it has gained the status of property. Thus governments generally do not have any right what so ever to agree to transfer such technologies. Although transfer of technology is part of several international agreements in the past including the KP, to all intents and purposes the process has never been realized for the reasons already elucidated. In order to realize the process of technology transfer, developed countries would have to devise a mechanism that facilitates placing climate change technologies in public domain. This would ensure that technologies needed by developing countries for addressing climate change concerns could be sourced competitively, and accordingly become affordable.

7.4 CDM has largely proved its potential to promote sustainable development in developing countries. Although there has been significant progress in developing CDM project portfolio, particularly in renewable energy in the country, there are some barriers in the operation of the CDM which needs to be looked into if the CDM is to enable significant growth of the renewable energy market in the country. The equipment cost of most renewable energy projects is significantly higher per carbon credit than the cost of other types of potential CDM projects. According-

ly, the volume of carbon credit from renewable energy projects is much smaller per unit of output than the volumes created by projects, which abate other greenhouse gases such as nitrous oxide or HFC. Further, there exists an inherent uncertainty about rule and modalities to be followed in the post Kyoto regime. Although the general trends suggest that carbon trading will remain central to any post-Kyoto agreement, there is still much speculation in this regard.

8. Climate Change-A common Responsibility

Climate change is a quintessentially global issue. It implicates literally every nation, and every person, on Earth. Ultimately it can be overcome only if all nations work together. The buildup of greenhouse gases in atmosphere influences systems that shape climate literally everywhere on Earth. The impacts of global warming will vary widely from place to place, but no nation is immune. It is futile for any one nation to limit its greenhouse gas emissions unless, ultimately, all do. However, it does not mean that every nation must act at the same time or in the same way, but all must assume their fair share of this common responsibility. Further, it is a long-term challenge. Indian response to the global climate mitigation would invarialy be governed by this guiding principle. Further, the fundamental characteristics of climate change include its global nature, long-term character, and it confronts us with deep inequities. Meeting this challenge will severely test the capacity of the global community, and institutions like the United Nations, to forge a common, effective path forward. It will require tremendous creativity and resourcefulness and also new ways of thinking and understanding.

9. Conclusion

9.1 There are no two opinions that the time has come to look into new paradigms for development and lifestyles that take into consideration the climate change dimension. There are reasons to believe that human survival is really at stake. Of course, there always would remain an element of uncertainty as to whether our projections and estimates will really hold. Even if they are exaggerations, still preventive measures would need to be taken up. The State of World 2008

Indian forests play vital role in harboring more than 45,000 floral and 81,000 faunal species of which 5150 floral and 1837 faunal species are endemic.

report has rightly observed, "There is no magic, single solution to the challenge of controlling greenhouse gases. It is a challenge of energy policy and of managing the transition to sustainable energy sources. This in turn has a great deal to do with the technological transition, access to invention, and intellectual property. It has to do with investment policy and the nature of investment agreements and the settlement of investment disputes. And it has to do with trade policy - the trade rules and how the trading system deals with issues at the frontier between trade policy and related policy areas. In short, the issue cannot be dealt with by treating each of the pieces separately from the overall picture of which they are but a part." At the philosophical level the climate change issue has direct linkages with our thinking pattern and the Gandhian concept of need-based living instead of the greed-based. The April 2008 issue of Time magazine has changed its signature cover border colour from red to green to underline the importance of the winning the war on global warming. Its editor, Richard Stengel, in his editorial has said that "we roll up everything into one mega proposal, a kind of 21st century Manhattan Project, using carbon-trading, alternative energy and an efficiency surge to get the most out of every kilowatt we produce-all with the aim of winning the war on global warming." Yes, there is no reason to dispute it.

9.2 Swami Vivekananda, who influenced thinking of millions of people in India and abroad had said, "We are responsible for what we are, and whatever we wish ourselves to be, we have the power to make ourselves. If what we are now has been the result of our own past actions, it certainly follows that whatever we wish to be in future can be produced by our present actions; so we have to know how to act." This is a sort of a mantra for action by humanity to act and design a world that respects natural heritage and keeps a close watch on our actions as they become habits over a period of time. The present surge of consumerism without honouring the environmental space is a result of actions of a materialistic society. The Indian spiritual heritage provides social and spiritual context for self-transcendence, altruism, offers space for contemplation in which to make sense of people's lives in deeper and more meaningful ways than those provided by consumerism. In the end, it will lead to new social ethics and norms, adherence to which will determine the survival of living beings in the carbon constrained world.

(Dr.P.C.Maithani is a scientist dealing on energy matters).

Improving carbon control—Who is the Culprit?

The U.N. climate change conference that concluded recently in Bangkok has made it clear that market-oriented arrangements such as the Clean Development Mechanism (CDM) and emission trading ushered in by Kyoto protocol will continue beyond 2012. The announcement comes at a time when some scientists have challenged the effectiveness of these measures and the emission estimates that have been put forth. The point of contention is that U.N. policies have overlooked the supply side of energy in developing countries, especially India and China. It is argued that developed countries like the United States (not a Kyoto protocol signatory) have done a lot to cut energy intensity (ratio between a unit of production and the amount of energy used to produce it) while China and India have not done enough and they must be brought on board and their emission limits capped. Alongside, demands are made for a policy that will increase investment in R&D, impose penalties such as carbon tax, and delink poverty reduction from the issue of controlling carbon emissions.

The European Union's experience in carbon markets has highlighted the need for improving the mechanism. Investment in clean technologies in a big way is undoubtedly a necessity. However, attempts to deflect attention from inequalities are to be seen as attempts to shift the debate in favour of developed countries. The huge difference between the developed and the developing countries in emission levels stares us in the face. Consider, for instance, the data given by the U.S. and India to the UNFCCC in their reports pertaining to 2007 and 2004 respectively. If the U.S. estimated the CO_2 emission due to power generation at 2,381,200 Gigagram (Gg) and that due to end-use consumption at 5,751,200 Gg, the corresponding figures for India were as

There are as many as 100 million species on Earth, of which only 1.7 million have been identified. Humans are but one of those species.

low as 353,518 Gg and 293,989 Gg. Studies also show that basic energy appliances in urban and rural India are present at a bare minimum level. For example, only 5.67 per cent of the rural population use liquefied petroleum gas for cooking and 44.5 per cent electricity for lighting. With geopolitical controls on alternative fuels, developing countries are compelled to meet their energy needs from their own resources including coal. Given this situation, how can policies be conceived as a simple matter of technology? Developing countries are actively embracing clean technologies. As of March 2008, about 950 CDM projects from 49 developing countries are registered with UNFCCC and another 2000 are in the pipeline. The Kyoto protocol of course needs to be improved but a wholesale debunking will mean another long process and further delay.

* Extracts from the Editorial, April 2000)

Off-Grid Power

1. Power produced from wind, biomass, biogas, solar photovoltaic and micro hydel-based power generation can help 25000 remote villages of our country.
2. Off grid power plants (10 to 500 kw) catering to 30 to 3000 consumers can supply power from 5 to 10 hours a day.
3. It will serve small users effectively, house holds, shop keepers etc.
4. Grids have poor load factor.
5. Off grids systems have little or no power loss.

What will India do to face the climate change and its fall-outs?

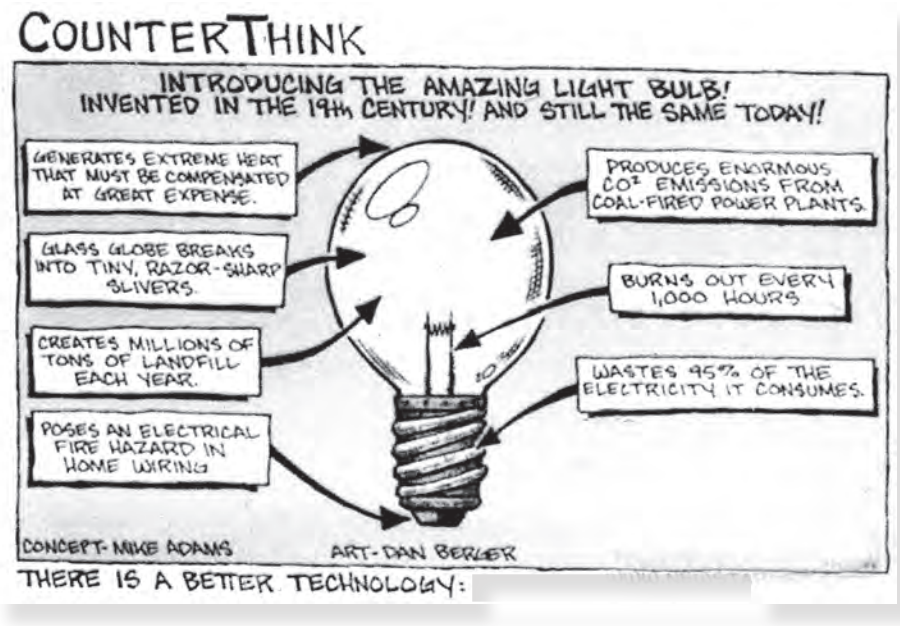
Jayant Sathaye

1. Temperature increases have led to drying in parts of India, Global Hydrological system has been impacted. The ecosystem, sea level, crop level and related processes have been influenced! Climate changes impacts are long term and cannot be stopped. The pollutants stay in the atmosphere for decades and centuries.
2. Humanity by its history has committed itself to experiencing the deleterious impacts of climate change, in the decades to come. Humanity should 1. Use fossil fuels as efficiently as possible, 2. Rely mostly on solar, wind and hydro and nuclear sources of energy. 3. Slow down or stop deforestation 4. Capture whatever aero sols and Green House Gases that are emitted from fossil fuel combustion. The captured gases are to be removed from the atmosphere where they cause warming. They have to be stored underground or in oceans and carbondioxide has to be separated by plants and in soils.
3. Global warming shall raise sea levels, make glaciers retreat and cause drinking water problems.
4. Adaptation and Mitigation are the possible responses to climate change. Mitigation is a preventive action and adaptation is a response to the ills warming will cause. Agriculture and fisheries have to adapt to climate change.
5. Industrialised countries should start reducing emissions to be followed by developing countries.

6. There are some NO REGRETS measures: Their benefits exceed their costs. Energy efficiency measures, reducing local air pollution, better combustion

Southeast Asia experienced the largest decline in forest area, with the annual net loss of more than 2.7 million ha per year during the period 2000-2005.

and fuel-saving are such measures, Developing softwares to predict and implement measures to reduce coastal



storm surges occurring as a result of global warming is another 'no regrets' option.

7. Energy Intensity is a measure of energy efficiency of an economy. India's energy intensity has been steadily declining from 1990, a commendable factor. For every one percent of increase in the economy, energy use has increased only by 0.9% China and in the industrial countries have done better with Energy intensities of 0.5% or there-abouts.

8. Energy use accounts for 80% of CO2 emissions world-wide. In Industrialised countries, Energy Effiency was the single largest energy-source compared to coal, oil and natural gas. In India, improved efficiency of the manufacturing sector and increasing share of service and IT sectors in the economy have combined in reducing energy intensity. The growing service sector bodes well for energy consumption and energy intensity.

9. Carbon emissions of an economy depend both on how efficiently energy is used by the economy and on the mix of fuels that constitute the energy supply. Standard coal is almost twice as carbon intensive per unit of energy as Natural gas. Oil falls somewhere in between. Using a proper mix can control emissions.

10. Future projections indicate that the energy needs will double for India by 2020. Industry and electricity generation will use more coal. The transporation, household cooking, captive power generation will use more petroleum products.

11. Except when it imports more natural gas, India's energy needs will force her to get more carbon intensive. Nuclear power reduces the chances of carbon emissions, but increases the risks of ra-

ditation.

12. Mitigation measures focus on better technology

13. Mitigation measures won't work if the development paths are inherently carbon intensive. Development policies in various sectors can have strong impacts of GHG emissions.

14. The operational question is how to harvest the potential. Developmental policies, programmes and individual actions, take climate change mitigation into consideration.

15. The ease with which these policies are mainstreamed, will depend upon 1. Mitigation technologies and practices 2. Underlying developmental path 3. No regrets options are easier to implement 4. Others have higher costs. 5. Coordination among stakeholders is required 6. There has to be a trade-of against other environmental, social and economic benefits.

16. India can choose how much carbon intensity it will have. Its power plants can use more gas and less coal.

17. India can improve its insurance and investment terms to recognize lower risks with green buildings.

18. We should go for afforestation in areas with minimum climate impact.

19. Technical electricity-distribution losses in India amount to more than 20% compared to 7 to 8% in industrialised countries. Reducing this loss will save money, reduce power plant emissions, also reduce G.H.G emissions.

20. Modern fuels in the place of charcoal and fire-wood for cooking would push up emissions, but the health and welfare of poorer people will improve.

21. The Indian government has been pro-clean development mechanisms.

22. India should try to maintain the decline of carbon intensity on its developmental path.

23. The Nation as a whole is yet to delegate its power of policy-making in this field to the provinces for better acceptance.

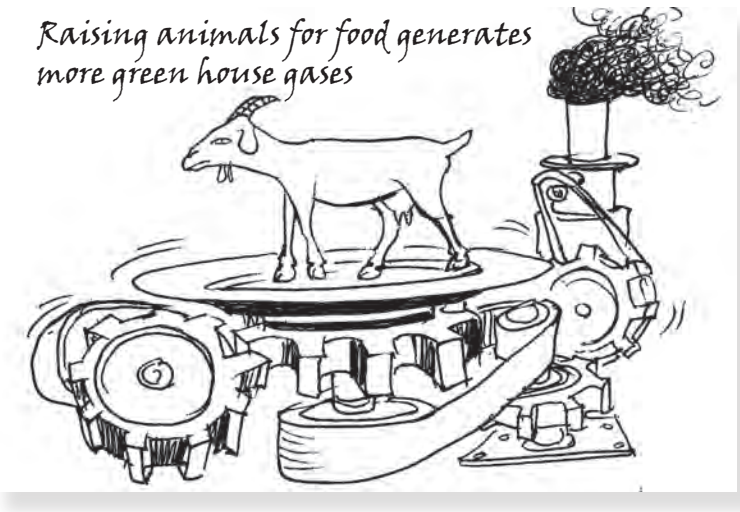
24. Climate change adaptation/mitigation policies and programmes have to be more and more participatory.

(Summarised from an article from The Hindu: Survey of the Environment 2007)

Global warming—a solution

Swami Dayananda Saraswati

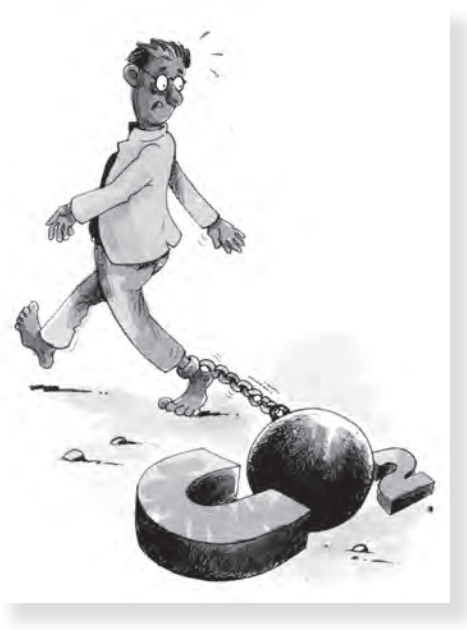
The Himalayan glaciers have been the perennial source of water for the rivers such as Ganga, Yamuna, Brahmaputra and Sindhu. Now the disturbing news is that the glaciers are receding due to global warming. This problem of increase in global temperature is real and in India it will cause irredeemable damage in more than one way if it is not addressed. One will find it difficult to believe the contention of some ecologists that the river Ganga would cease to be perennial in six to forty years of time, that the other rivers of Himalayan origin would suffer the same fate.


Raising animals for food generates more green house gases

As a, human being, I have a custodial relationship to the Mother Earth. Global warming testifies how indifferent and careless we have been in discharging our care-taking responsibilities. Now that we see the seriousness of this problem we need to take certain ameliorating measures. A report from the United Nations in the year 2006 reveals the surprising fact that "raising animals for food generates more green house gases than all the cars and trucks in the world combined." Tens of billions of animals farmed for food release gases such as methane, nitrous oxide and carbon-di-oxide through their massive amounts of manure. Animals such as cow and sheep, being ruminant, emit huge amount of methane due to flatulence and burping. "The released methane", the report says, "has 23 times the global warming potential of CO_2. "It is very alarming to note that the livestock industry alone is responsible for 37% of human induced methane emissions. To make room for these animals to graze, virgin forests are cleared. The livestock industry also

needs vast stretches of land to raise mono crops to feed the animals. The CO_2 that the trees and plants store escapes back into the air when they are destroyed.

Growing fodder for farmed animals implies heavy use of synthetic fertilizers produced with fossil fuels. While this process emits a huge amount of CO_2, fertiliser itself releases nitrous oxide (3)—a green house gas that is 296 times more potent than CO_2. Alarming though these facts are I see in them a



reason for hope. All that the people all the world over have to do is to avoid meat eating. In the absence of demand for meat there is no more need for breeding millions of animals for daily slaughter. The reversal of global warming is a certainty.

The meat lobby cannot do anything if the change is from the individuals. A single individual by simply not consuming meat prevents the equivalent of 1.5 tons CO_2 emissions in a year. This is more than the one ton of CO_2 emissions prevented by switching from a large sedan to a small car. One needs to have an honest commitment to save the mother earth who has been relentlessly patient and magnanimous since she began bearing life. There are a number of reasons for one to be a vegetarian. People given to meat eating think that a pure vegetarian diet is optional. But now they have no choice if they are alive to what is happening to this life-bearing planet. There is no justification whatsoever for one to continue to be a non-vegetarian knowing the devastating consequences of meat eating.

Promotion of vegetarianism does not require any legislation from the State. It does require a change of heart on the part of meat eating individuals anywhere on this planet. I cannot appeal to the tigers and wolves. They are programmed to be what they are. Being endowed with free will only a human being can make a difference by exercising responsibly his or her choice.

The threatening inundation from the melting icebergs in the North Pole is avoidable and the perennial flow of the holy Ganga and Yamuna would continue if only there is a change of heart on the part of every meat eater. If it is too much for one to switch to be a total vegetarian one needs to give up at least red-meat eating. This is the only option one has.

(The New Indian Express 18.3.2008)

Indian forests and climate changes

N.H.Ravindranath

In India 2 lakh villages are located inside or on the fringes of forests. 20 crores of people depend upon forests for their livelihood. 3 crores of people are directly engaged in gathering and trading non-timber forest products such as fruits, seeds, flowers, leaves honey and gum. Around 7 crores of tribals largely depend upon forests for their livelihood.

Under low levels of warming, plant productivity and wood production may increase due to increased concentration of carbon-dioxide in the atmosphere. Currently forest systems appear to be storing increasing quantities of carbon due to Biomass productivity gain. This may decline at higher temperatures.

To cope with climate-induced changes in forest ecology, we should 1. Prevent fragmentation of forests 2. Practise forest conservation 3. Enhance the coverage under protected areas and 4. Link them 5. Undertake large afforestation progmmes 6. Grow multiple species to reduce pressure on natural forests 7. Local communities are to be involved in forest conservation and management.

India has a large afforestation programme of over one million hectares annually. India has a plan to bring one third of its geographic area under forest cover. These newly planted forests particularly with

long-rotation species such as teak, will be affected by climate changes. Adaptation practices are to be incorporated in the afforestation programme.

* Extracts from the Suvey of the Environment 2007

World Health Day to focus on climate change

The World Health Organisation (WHO) is placing health at the centre of global dialogue by making it the theme of the World Health Day, April 7, 2008.

This follows an overwhelming scientific consensus that climate change is happening and is human induced, making it one of the most critical challenges of our time.

If the increase in greenhouse emissions continues at the current pace, air quality will suffer greatly and respiratory illnesses will worsen. Lack of safe water will most probably trigger outbreaks of diarrhoea and other food and water-borne diseases.

Projecting the risks associated with climate change in 2030, the WHO estimates that the number of malnutrition cases will increase by more than 10 per cent.

Climate-sensitive diseases such as dengue and malaria are estimated to increase in terms of geographical distribution and incidence. Higher minimum temperatures will allow many disease vectors to thrive, leading to new risks in regions where they were previously less significant.

The people in the greatest danger include the very young, the elderly and the medically frail. Low-income countries and areas where malnutrition is widespread, education is poor and infrastructure weak will have the much difficulty adapting to climate change and related health hazards. The WHO estimates that warming and precipitation trends due to anthropogenic climate change currently claims over 1,60,000 lives a year.

Enhancing awareness

The WHO and its partners in countries will enhance public education and awareness of the linkages between climate change and human health. Early alert systems for heat waves, other impending weather extremes and outbreaks of infectious diseases will be strengthened. Robust disaster preparedness, enhanced infectious disease control programmes and improved surveillance will be part of the health sector's response.

*Extracts 7.4.2008

Climate Change-some facts

1.First Victims of climate change will be children

2. Floods, droughts and other disasters link directly to climate change.
3. Direct consequences of 150 years of carbon-rich life style have come home to roost.
4. Children especially of Africa and Asia face a future of more severe and more frequent disasters, diseased and conflicts.
5. Clean water will be difficult to access.
7. Child poverty, inequality and death will be inexorable.
8. Climate change-induced child death in sub-Saharan Africa and South Asia may increase by 1,60,000 a year.
9. In all, lack of water, lack of food, increased disease, less education, less protection and reduced life-chances stare on the faces of children. These problems will afflict them for the rest of their lives.
10. Diminishing water supplies, increasing malarial attacks, food shortages call for immediate attention.

(Guardian Newspapers Ltd. 2008)

Indians are world's greenest consumers

In a survey conducted by the National Geographic Magazine/Channel, Indians have been found to be most caring towards the Environment. They hold the joint first place with Brazilians. Their day-today behaviour proves it. Environmentally sustainable behaviour, consumption impacting housing, transportation and food.
(P.T.I)

Future Of Wind Energy In India

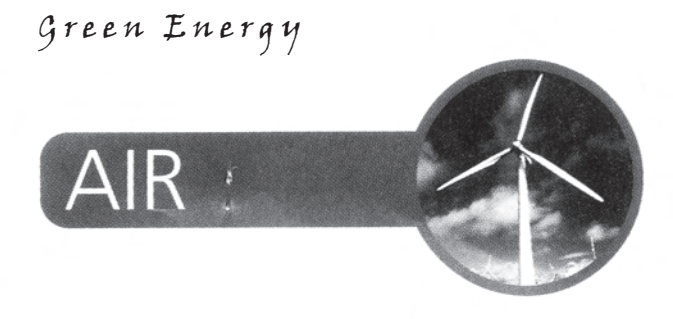
Mr.Rakesh Bakshi

1. How do you perceive the global energy scenario shifting in favour of renewable sources of energy in the context of skyrocketting oil prices?

The oil crisis in the 70s paved the way for global awakening on energy security. It has remained a prime concern for nations of the world since economic development and social well being are so much dependent on energy. The search for alternate sources of energy has been an on going process but a paradigm shift towards renewable energy occurred only two decades ago, fuelled by environmental concerns. Skyrocketing oil prices, further reinforce the need for imaginative planning and decisive action to achieve energy security. In this context, exploitation of renewable energy sources can play a crucial part in bridging the gap between global energy demand and supply and at the same time facilitate sustainable development with emphasis on ensuring a clean environment.

2. What are the latest developments in the Indian wind power sector?

Indian wind power sector has been vibrant and highly successful. We are the wind leader of Asia and ranked fourth in the world behind Germany, the US and Spain, with an installed capacity of around 3595 MW. During the fiscal 2004-05, we added 1112 MW, a whooping 45% increase from the previous year. There has been impressive spread, growth and expansion in the wind sector, thanks to the bold initiatives of manufacturers and growing investor confidence in wind power. Our manufacturing base has become strong and less dependent on imports. We have improved quality, enhanced efficiency and added new range



of products and services while spreading operations to hitherto unexploited areas. Indian wind sector has been evolving and emerging over the past two decades and the future of the industry appears bright at a time when the country is experiencing an accelerated economic growth.

3. How do you justify wind energy as a viable alternative in the Indian context?

The technical feasibility of harnessing wind and making use of it for various energy needs of mankind has been well established. It is indeed one of the most viable and cost effective options for grid connected power supply.

India is a country having abundant supply of wind. In fact our wind potential has been assessed as around 45000 MW. We have the technology, human resources, financial muscle and the awareness and wisdom to tap this great reservoir of unlimited, natural and clean source of energy.

The cost of installing wind power is around Rs.5 crores per MW, which is very much comparable to thermal power. Aside from this, the gestation period is much shorter than hydel or thermal power projects. With larger volumes, the economies of scale will bring down the cost further.

Being clean energy, investment in wind sector will also attract Clean Development Mechanism (CDM) benefits, albeit, we are yet to put in place a proper system to evaluate and claim the carbon credits.

Indian wind industry enjoyed a few fiscal concessions in its infancy. Even though many of these have since been withdrawn, the industry has withstood the pressures and emerged as a sunrise industry wooing heavy private sector investment. It is a testimony to the viability of the wind power projects that more than 97% of investment has come from the private sector and the sector is growing at a pace as fast as the IT and Telecom sector.

4. What is the significance of energy security for sustainable development? What should be the realistic share of renewables in the overall energy mix for India?

When we talk about sustainable development, we keep the well being of future generatiaons in mind. We cannot be callous and reckless in energy consumption today leading to shortages in the future.

In the long run India needs an integrated

energy policy, which moves away from excessive dependence on fossil fuels and addresses the tremendous resource potential that is available to us through alternate energy sources.

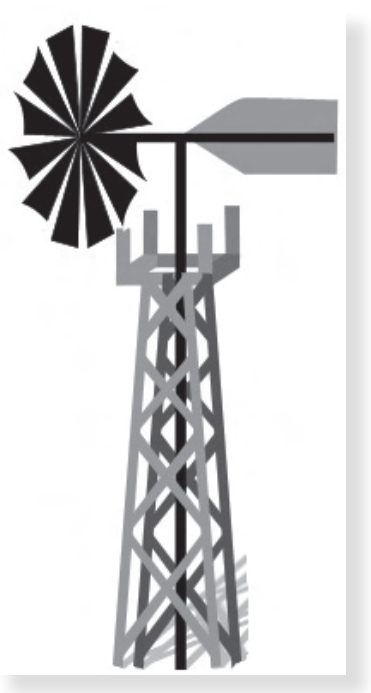
In India, in order for us to move towards a sustainable energy future, we must address all the viable energy options that are available to us. These options should be reliable and affordable. We need to address greenhouse gas emissions and global warming. We should select the right energy mix based on a well diversified portfolio of domestic and regionally traded sources of energy, thereby minimizing the energy price volatility and ensuring uninterrupted energy supplies.

While use of energy is rising rapidly in India, upto 8,00,000 villages still lack access to electricity.

India has an abundance of renewable energy sources such as wind, solar, small hydropower and biomass. Renewable energy not only augments energy generation but also contributes to improvement in the environment. Hence, in order to achieve sustainable development without causing further atmospheric pollution, the growing energy requirements in India should be met by a judicious deployment of renewable energy resources by evolving a suitable pattern of energy mix. The present share of renewables in the energy basket is rather low at 3.5 per cent. We should strive to raise it to 10 per cent by 2012. This should be further increased progressively.

5. How do you rate the employment potential of wind industry?

Wind industry generates a large number of jobs both direct and indirect. More importantly, it makes room for enterprise. It also has a high degree of rural penetration especially into areas which are undeveloped and remote. I wish to dwell more on the aspect of enterprise because one sees a number of entrepreneurs who have taken up new enterprises in support of the wind sector and in turn more and more enterprises are mushrooming in direct as well as indirect support of this fast growing sector. The phenomenal growth rate in the wind sector has led to tremendous expansion and the industry is constantly creating and providing opportunities for new enterprises and in turn more and more jobs.



6. What is the impact of wind power development for rural India?

You have to look at the countryside, wherein wind farms have come up, to get a fair idea of the impact of wind power development,

be it the Indian peninsular tip in coastal Tirunelveli-Kanyakumari Districts of Tamil Nadu, Jogimatti hills in Chitradurga District of Karnataka, the Deccan plateau in Maharashtra or the sand dunes around Jaisalmer in Rajasthan. Waste and barren land in these areas not only sport magnificent power generating wind turbines, but also the installation of wind farms in these backward and remote areas has led to an all-round development—roads, buildings, schools, hospitals, markets, hotels etc. There is work for people—there is room for enterprise.

7. In order to set up a wind farm project what conditions are evaluated?

The first and foremost is to ensure that utmost care is taken in site selection based on the wind data, grid availability and scope for development of necessary infrastructure. The availability and cost of land is an important factor for consideration while planning to set up a wind farm in addition to wind potential, power evacuation facility and logistics for moving of the equipment and material to the site. We specialize in providing total customised solutions, from concept to commissioning, for setting up wind farm projects.

8. What are the expansion plans of Vestas RRB in the immediate future?

Vestas RRB is on an accelerated growth path. More than 1000 Nos. Vestas type Wind Electric Generators (WEGs) of various capacities are operating successfully at different locations in the States of Gujarat, Maharashtra, Madhya Pradesh, Orissa, Tamil Nadu, Kerala and Karnataka. Based on our sales projections we expect to instal around 200 MW of wind power capacity for various corporate clients during the current financial year. As part of our indigenisation drive, we are also planning to set up a blade manufacturing facility at Chennai within one year. We have been experiencing a growth rate of more than 100 per cent per over the last two financial years and this fiscal we expect our sales turnover to be more than Rs.1000 crores.

9. How do you visualize the future of wind sector in India?

India has an eviable record of achievements in the wind sector. I do envision a bright future for the wind industry in view of our enormous potential, advanced technology, trained manpower, years of experience and our capability to invest. Having said that, I would like to stress upon the need for a uniform and long-term policy to facilitate sustained development of this important sector which in turn can contribute tremendously in providing clean and green power – thus empowering our grids. This in turn would lead to enhancing one of the most vital components of our infrastructure requirements i.e. energy.

(From: The New Indian Express 21/6/2005)

Push solar energy

(It is inexhaustible and readily available almost all over the country, all round the year)

S.S.Kaimal

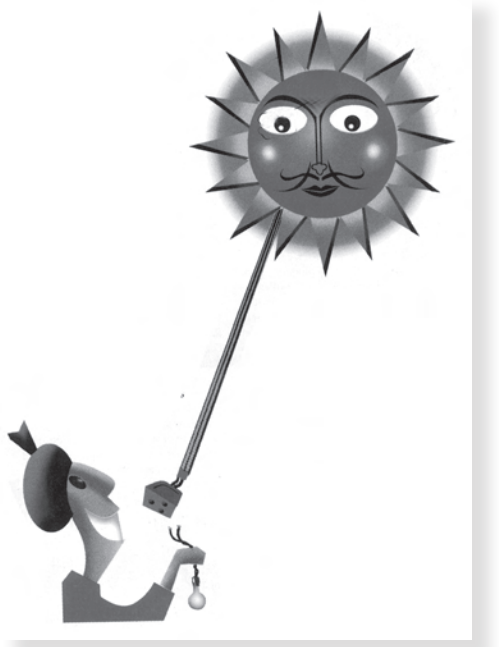
According to a recent report of the United Nations, solar energy falling over an area of 800 km x 800 km., harvested with the currently available technology is enough to meet the energy needs of the whole world (The Hindu, June 7, 2006). The solar energy radiation falling over India is estimated to be about 5,000 trillion kWh a year.

Assuming a population of 1.5 billion in 2025, if even one per cent of this can be harvested, it will provide about 90 kWh a day per capita, which is more than ample. And there is almost unlimited scope for evolving better solar energy harvesting technologies.

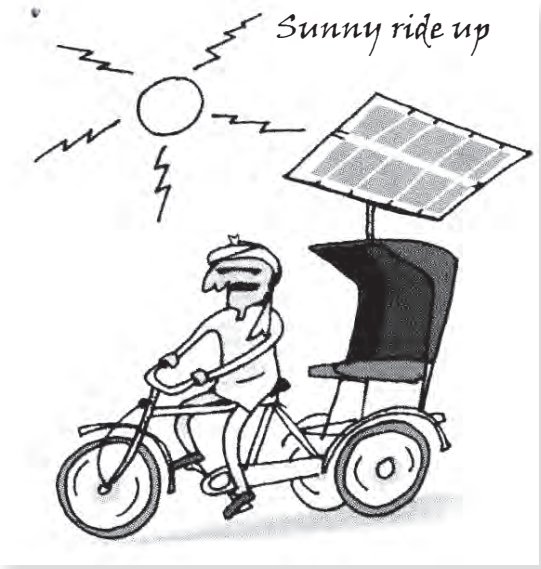
Ever since the dawn of civilisation, mankind has depended on the photosynthesis-biomass route to harvest solar energy. But now a stage has been reached when any further "progress" along this route is fraught with the great danger of global warming, climate change and consequent disasters.

Hence the need to consider other technologies for harvesting solar energy. Solar photovoltaic technology is such an alternative. In fact, German politician Hermann Scheer, winner of the Right Livelihood Award, has made out a convincing case for mankind to change over from "fossil fuel economy" to "solar economy" in his book The Solar Economy – Renewable Energy for a Sustainable Future.

The advantages of solar photovoltaic energy, particularly for India, are fairly obvious. It is inexhaustible and readily available



almost all over the country all round the year. It is clean and non-polluting. It has no moving parts and involves negligible running costs. It is amenable to decentralised generation at the points of consumption, not only eliminating transmission losses, but offering many socio-economic benefits, by empowering families and communities to be self-reliant for their energy needs.



The paradigm shift from fossil fuels to solar photovoltaics is not a utopian fancy as it may seem at first sight. Already, all the satellites in outer space on which the vast majority of mankind depends for communication, entertainment, weather forecasting etc., are powered by solar photovoltaic arrays.

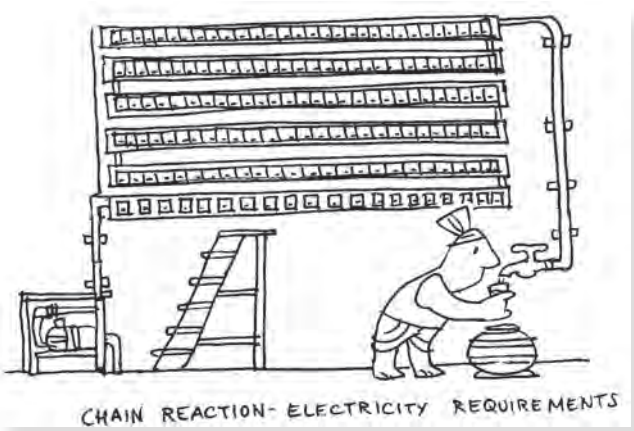
This writer knows a family of farmers in California who have totally "solarised" their small farm. Every building in the farm has enough solar panels on its roof to meet its energy needs. And they have been able, within three years, to recoup 50 per cent of their capital expenditure on solar photovoltaic (SPV) installations, in the form of savings on grid electricity bills. In our own country, as on December 31, 2005, 13,00,000 SPV systems with an aggregate capacity of 245 MW are functioning.

However, there is a flip side to this rationale. The currently common silicon-based SPV panels are costly. They have a conversion efficiency of around ten per cent. Their manufacture is highly energy intensive, needing about 10 watts of electricity to create one watt of SPV capacity. There is also an acute shortage of pure silicon. They need costly batteries to store the energy.

But these are the problems which determined research can solve. In a speech in 2006 our then President A.P.J.Abdul Kalam said that with carbon-nano technology it is possible to develop solar cells with a conversion efficiency of 50 per cent. If SPVs are made the main thrust area of energy development, it is likely that their costs will come down dramatically as happened in the case of computers and mobile phones.

In such a situation, India can set up a Solar Energy Commission on the lines of the Indian Space Research Organisation with a clear mandate to achieve a clearly defined target (say, substituting 50 per cent of the country's fossil fuel consumption by solar

energy, within ten years). Second, set up a able.



Make it mandatory for large houses, buildings and factories to create standby fallback energy capacities to a prescribed proportion of their total energy consumption either by SPV panels and / or biogas plants which will process biodegradable solid waste created on the premises. All panchayats and towns should be asked to set up biogas plants as the Kadakkal panchayat in Kerala and the Namakkal municipality in Tamil Nadu, to convert solid waste into energy.

large number of factories to manufacture SPV panels with the best technology avail-

* Extracts From The Article 2007

GOOD NEWS FOR A CHANGE

In the year 2005 the amount of electricity produced by environment-friendly windmills increased by 24% to 60,000 megawatts. The production of photo-voltaic cells which generate electricity directly from the solar light went up by 45% in the year 2005. All over the world 6090 megawatts of electricity get generated through this eco-friendly solar technology.

(From: Vital Signs, World Watch Instt. Washington 2007.)

Cooking with the sun

As a piece of equipment that performs an essential function with only sunlight for fuel, the solar cooker has caught the imagination of many since the late 18th century. Over the past few decades, several hundred thousands of these gadgets have been put to use; there were 617,000 in India in 2007. They serve as recreational cooking gear in the backyard of affluent American homes. In resource-poor Indian villages, Darfur refugee camps, and poor communities setting up food ventures, they act as a vital facility. Although not suitable for a fast-paced, instant-cooking lifestyle, design variants of the solar cooker hold promise. Perhaps the best-known installations of scale in India are those at Tirupati, Shirdi, and Mount Abu, where several thousand meals are cooked everyday. With policy support, solar cookers can play a greater role in easing the pain of rising cooking gas prices for the middle class. Solar box cookers for the home raise the temperature to about 140 degrees Celsius by trapping the sun's heat in a black enclosure. Other designs concentrate the heat using a reflecting parabolic dish, cooking the food directly or by generating steam in pipelines; some have the facility to track the sun's movement. The slow-cooking method suits some foods well, retaining natural moisture and vitamins. But it is unsuitable where quick results or frying are important.

Many residents of the hotter cities would

be tempted to give solar box cookers a try, as a supplement to liquefied petroleum gas. Without subsidy, a cooker costs the equivalent of four LPG cylinders. The Tamil Nadu Energy Development Agency estimates LPG savings of 20 to 40 per cent for a normal pattern of use based on the cooker model. Yet, it must not be forgotten that the existing performance levels have been achieved with only basic research on design and materials. Official policy could do much more to encourage innovation. Better heat retention in the cookers using thermal fluids is being attempted. Good results have also been obtained from newer insulation materials in U.S. models. A beginning could be made by making the existing cookers cheaper and more widely available. The solar thermal industry is pinning its hopes on institutions, but it may find residential communities primed for adoption too. Steam and thermal pipeline technologies hold great potential for large real estate projects. On the question of subsidy, the Ministry of New and Renewable Energy will no doubt see the anomaly of depriving solar box cookers of the benefit, while LPG consumers continue to enjoy it.

* Extracts

ARE YOU MONEY-MINDED?

How much will the climate-change cost us! Global temperatures will rise by an average of 3°c due to climate change. It will bring about catastrophic damage around the world. A rise of this magnitude would cause famine and drought and threaten millions of lives. Cereal crop production would drop by anything between 20 million and 400 million tonnes. 400 million people will risk hunger. 3 billion people will undergo risk of flooding, and go without access to fresh water supplies. Half of world's nature wealth will be destroyed. A fifth of the worlds coastal lands will go.

So say Sir David King U.K. Government's chief scientist and Hadley centre a world leader in climate change modeling. Tony Juniper, Director of the organization Friends of the Earth wants humanity to seize the opportunity, switchover to sustainable energy, generate many millions of jobs, help to end fuel poverty.

(The Guardian 2006)

'Smart' biofuel crops ensure food and environmental security

M.J.Prabu

While the global debate rages on whether the biofuel revolution is causing imbalances in food security systems and increasing the greenhouse gas emissions the 'smart' biofuel crops developed, utilized and promoted by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, Andhra Pradesh, ensure energy and environmental security.

According to Dr.William Dar, Director General of ICRISAT, the time has come to ensure that only smart biofuel crops are developed and utilized so that they can link poor dryland farmers with the biofuel market, without compromising on their food security, or causing environmental damage.

Energy security

"Smart biofuel crops are those that ensure food security, contribute to energy security, provide environmental sustainability, tolerate the impacts of climate change on shortage of water and high temperatures, and increase livelihood options," he said.

Through its Bio Power Strategy, ICRISAT is developing and promoting sweet sorghum as a major feedstock for producing bioethanol.

Sweet sorghum is a carbon dioxide neutral crop, which is a big contributory factor to being called a smart crop.

ICRISAT-bred sweet sorghum varieties and hybrids have increased sugar content in their stalks.

It has a strong pro-poor advantage since it has a triple product potential, that is grain, juice for ethanol, and bagasse (waste) for livestock feed and power generation.

Its highlight is that there is no compromise on farmers' food security, since the grain is available for the farmers,

along with sugar-rich juice from the stalk that can be distilled to manufacture ethanol.

Cost-effective

There are other benefits also. It is a cost-effective and competitive feedstock. It has a shorter crop cycle of 4 months compared to sugarcane, which is a 12 month crop and requires lesser water.

It requires only half of the water required to grow maize and one eighth of the water required to grow sugarcane. The cultivation cost is less when compared to sugarcane.

The juice from the stalks is used for fuel alcohol production. The leftover stalks (called sillage), after juice extraction, can be used for animal feed, according to Dr.Belum Reddy, Principal Scientist, Sorghum Breeding, of the Institute.

Sweet sorghum is tolerant to water scarcity and high temperatures, two qualities which will keep the crop in good stead in the context of climate change. It also has high water use efficiency.

Environment friendly

It is a carbon dioxide neutral crop that makes it environment friendly, and does not add to greenhouse gas emissions. During its growth cycle, a hectare of sweet sorghum cultivation absorbs about 45 tonnes of carbon.

It has been found from studies that gasoline blended with ethanol has lower emissions when run through an automobile engine than pure gasoline.

Field experiments conducted have proved that from one hectare of sweet sorghum, a farmer can harvest about 30 tonnes of fresh stalk. The cost of cultivation of sweet sorghum works out to Rs.10,500 per hectare. It generates a total income of Rs.21,000 with a net return of Rs.10,500.

Good animal feed

The stalks of sweet sorghum are relished by cattle and the digestibility is higher compared to grain sorghum. In the absence of a distillery, the farmer can sell the stalks to animal feed manufacturers. The sillage from sweet sorghum stalk is a good animals feed like grain sorghum.

ICRISAT's initiative to produce biofuels is not limited to bioethanol from sweet sorghum alone.

Water shed project

Through its watershed development project, it it promoting the cultivation of Pongamia and Jatropha from which biodiesel can be extracted.

*Extracts from the Article

The green debate that pits food vs.biofuel

Lisa Stiffler

The number of cars and trucks in some regions of the United States that carry bumper stickers with pronouncements such as "Biodiesel: Mother Nature Approved," or "I love the smell of biodiesel in the morning," and even 'Ethanol: No war required,' has blossomed in recent years.

But with growing fears over biofuels stealing from dinner plates to fill fuel tanks, people are starting to wonder: How green are biofuels?

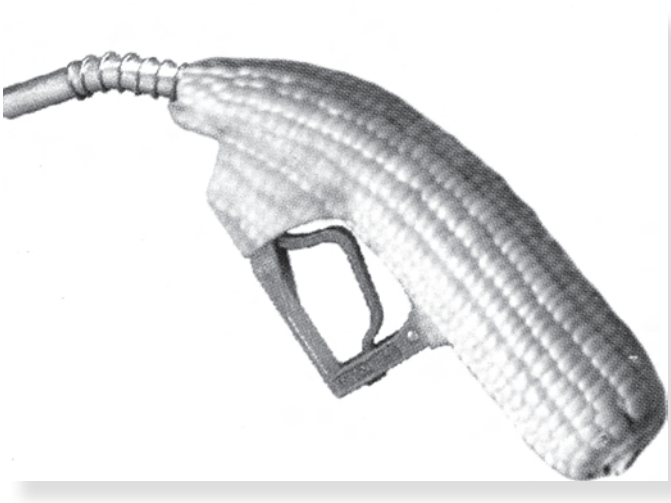
The concerns are not only about traditional American food crops such as corn beings diverted to produce ethanol. Critics say the use of foreign-grown palm oil and soybeans as a biofuel source leads to the destruction of precious rainforests. And the very act of producing certain biofuels generates greenhouse gases that contribute to climate change—although generally in lesser amounts than fossil fuels.

This past week April 2008 the food concerns reached such a frenzy that top international food scientists called for a halt to biofuel production in order to bring prices down, and Europeans are talking about scrapping, at least temporarily, goals for biofuel use.

The competition between food and fuel now will possibly intensify—hitting developing countries the hardest. Global experts predict that to feed the world's growing population, some 500 million more acres of cropland will be needed by 2030, representing a 20 per cent increase.

At Dr.Dan's Alternative Fuelwerks in Ballard, owner Dan Freeman is feeling wrongly maligned.

He said that critics are confusing the biodiesel that he sells with the petrol-additive ethanol, which in the United States is made almost exclusively from corn, mostly grown in the Midwest of the country.



People come to him and say "you're driving up the price of corn and killing Mexicans," Mr.Freeman said on a recent afternoon, taking a break from greasy repairs to a jacked-up older diesel Mercedes.

Mr.Freeman, who was among the earliest biodiesel retailers when he opened in 2001, is choosy about his fuel sources. He regrets buying his biodiesel from out of State, but it is the only way to get 100-per cent U.S.-grown, soy-based fuel. He likes the crop because the fuel oil is extracted from the bean, then the remainder of the legume is used to feed livestock, reducing the impact on food production.

"Our big goal is to have locally grown and consumed (biodiesel)," Mr. Freeman said. "That really hasn't happened yet.'

Other current biodiesel sources in the U.S. include canola, rapeseed and cooking oil. Ethanol comes from sugarcane as well as corn. The only way to know what your biofuel is made from is to ask the producer.

While biofuels do compete for food and cropland, experts said they are not the primary problem when it comes to soaring food prices and global food shortages. A spate of weather-related disasters – droughts in Australia and Russia, frost in Midwest U.S. torrential summer rains in Europe—made a mess of crops over the past year. Rising incomes in China and India, it is being theorised, mean many more people are eating higher on the food chain, also sending more crop quantities to feedlots to grow beef and pork. High prices for fuel and fertilizer also contribute to the food woes. But biofuels have other problems.

Researchers from the University of Washington and the Seattle office of The Nature Conservancy examined the most popular plants used to make biodiesel and ethanol.

They looked at the amount of greenhouse gases generated in the growing, harvest-

The Himalayas is the home to many rare species. Nearly about one third of all mountain animals live here.

ing, producing and burning of fuel made from different crops. Their study, published in February (2008) in the peer-reviewed journal Conservation Biology, tallied the amount of water, fertilizer, pesticide and land needed to grow the plants. It looked at biofuels' impacts on biological diversity as land was shifted from various crops and fields and forests to fuel production.

All of the biofuel plants consume carbon dioxide during photosynthesis, helping reduce the effects of climate change. Different crops, however, burn fuel in the form of fertilizer, machines used for harvesting, in the refining process and so on, meaning that some produce more greenhouse gases than they remove.

Tracking corn from seed to ethanol, it creates greenhouse gas emissions on a par with diesel and only slightly less than petrol. But harvesting native prairie grasses for ethanol leads to a net reduction in the planet-warming pollutants.

On the biodiesel side, palm oil, soybeans and canola decrease carbon dioxide emissions to about half that of diesel.

Algae—which some see as the promising green light at the end of the biodiesel tunnel – consumes large amounts of carbon dioxide, greatly outweighing the energy spent to turn it into fuel.

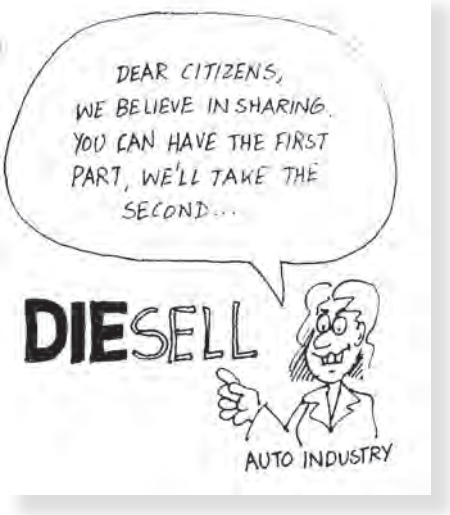
"We're advocating biodiversity-friendly and climate-friendly biofuels, and how do you achieve that?" asked Elizabeth Gray, a Nature Conservancy scientist and one of the authors of the study.

"We need to move as quickly as possible beyond corn as a biofuels stock," she said. "We really need to start investigating alternatives more vigorously."

On the farm

Bill Warren and his two brothers farm 4,000 acres in the foothills of the Blue Mountains in Washington State. The second-generation farmers raise wheat, peas, barley, hay, cattle, apples and pears. None of it is destined to fire up a diesel car or truck capable of running mostly on ethanol.

In the first half of this decade, crop prices



tanked—corn was below $2 a bushel, wheat was around $3. Today, corn sells for nearly three times that amount, and wheat has more than doubled in value.

"There's more money for food than for bio-

fuels," said Mr.Warren, who is also chairman of the Washington Farm Bureau's Biofuels Advisory Committee. "As far as growing biofuels in the Pacific Northwest, it's not something we're going to be engaging in as farmers in a large scale. It's not attractive at all."

In 2006, lawmakers approved legislation requiring that ethanol make up 2 per cent of petrol and that biodiesel replace 2 per cent of diesel in fuel sold in Washington by December 2008. The idea was to provide a guaranteed market to local farmers looking to transit into the potentially lucrative biofuels industry. It has not worked out like that.

No one is making ethanol here. There are four major biodiesel producers, but the largest of them is located on the coast, nowhere near Washington's farm country, and it uses Canadian-grown canola to generate biodiesel. Some producers use Northwest canola, Midwest soybeans, animal byproducts after slaughter, and used cooking oil from restaurants and manufacturers of processed food.

That does not mean Washington will not ever be a player in the biofuels economy.

"All kinds of innovative things are going on right now," said Valoria Loveland, who just retired as director of the State Department of Agriculture.

Second-generation feedstocks

The potential for fuel from algae and wood debris – the so called second-generation feedstocks—is exciting, but elusive so far on a large scale.

When it comes to using these new feedstocks, it is a question of "if and when," said Duff Badgley, the State's Green Party candidate for Governor and an outspoken biofuels critic. He argues that the future promise of environmentally sound fuels is being used as an excuse to continue investing in current, ecologically harmful biofuel production. "Biofuels are an environmental scourge," he said.

Mr.Powell notes that the original interest in biofuels was driven by a desire to increase America's energy security and independence and to give farmers an economic boost. Worries about the environmental impact came up more recently.

"There are bad biofuels and there is potential for the good ones," he said. "The potential for the good ones we haven't fully figured out yet." He added: "It could turn out to be a good story." –

New York Times News Service.

W.D.B. Climate change shall enhance the worth of resilient species such as sorghum, pearl-millet, chickpea, pigeon pea and groundnut. India is rich in their varieties.

Trade war brewing over U.S. biofuel subsidies

David Gow

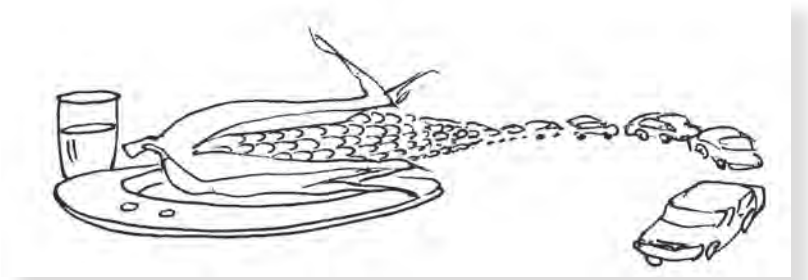
European biodiesel producers triggered a fresh transatlantic trade war early in 2008, by urging the EU to impose punitive duties on cheap imports from the U.S. Low-priced imports of biofuels, as part of the so-called "splash and dash" trade, are putting many European producers out of business, the industry group claims.

Their American rivals immediately hit back by urging the federal government to take action against any protective measures for the European industry. The row comes as oil prices have risen to new highs this week, close to $120 a barrel, and world food prices have surged partly as a result of pressure on land from biofuel production.

The European Biodiesel Board said it had lodged a complaint with the European commission over competition from the U.S. that was putting EU producers out of business. It wants duties on "B99" biodiesel exports (biodiesel with I per cent petroleum diesel, claiming they are unfairly subsidized and then dumped in the EU.

U.S. biodiesel exports are subsidized by up to $300 a tonne. Some trading firms have also been shipping biofuels to the U.S., where they add a "splash" of mineral diesel to qualify for the subsidy and then send the fuel back to the EU. These exports have risen dramatically since last year, causing what the EBB calls "severe injury" to-European producers.

This month D1 oils, a leading but loss-making U.K. producer, said it would shut all its British refining operations as a direct result of cheap imports. D1 said the economics of the business were now so poor that it would be lucky to make much on the disposal of its sites.



Elliott Mannis, D1 Oils' chief executive, said it was "extremely frustrating" that the company had been forced to bow out of refining because nothing had been done to stop the deluge of B99 biodiesel from the U.S. "It's an unbelievable situation and there is no end in sight," he added. Brussels sources said the EBB had a strong case.

Guardian Newspapers Limited, 2008.

He does not waste opportunities
He uses wastes as opportunities

Shri V.Chandrahasan has devised methods of complete recovery of mercury from caustic soda plant wastes. Using waste chlorine and waste caustic soda solution or calcium slurry, he devised ways of manufacturing sodium hypochlorite, a valuable product. He solves the pollution problem and waste-disposal and handling problem. He actually recovers valuable products and by-products in Chemical plants in Kerala. He has also planned ways of recovering biogas from canteen-kitchen wastes.

In a titanium dioxide plant where he worked, huge quantities of waste iron-oxide accumulated causing waste-yard-space-problem. Combining the iron-oxide with a bonding agent and some cheap filters, fine quality bricks were made.

Shri Chandrahasan feels that with a little innovation and cooperation from the management, wastes could actually yield wealth.

(DATE 15/5/2000)

W.D.B. Plankton a microscopic sea organism soaks up to large amount of Co_2. Those part of sea surface which lack plankton can be made to bloom with them by adding iron to such dead spots.

Bio-fuel from Marine Micro algae

R.Vimal Kumar

The Fisheries College and Research Institute (FCRI) in Tuticorin has made a breakthrough by standardizing a research protocol for production of bio-fuel from marine micro algae.

A team of scientists at the Fisheries Biotechnology Centre of the FCRI, led by S.Felix, has extracted bio-fuel from marine micro algae using 'Transestrification (conversion of an organic acid ester into another ester of that same acid) method,' involving catalysed chemical reaction on micro algal oil.

"We have used sulphuric acid as a catalyst for transestrification during our trials," said V.K.Venkataramani, Dean. Marine micro algae isolated from seawater was first cultivated under autotrophic and heterotrophic culture systems. In autotrophic system, the algae were grown in a standardized culture medium. Culture vessels were thermostatically controlled at 25 degree Celsius in the air-conditioned laboratory of the institute and illuminated at 1,000 lux by cool white fluorescent lamps.

"The mass culture has been achieved by transferring algal broth culture to larger capacity tanks," Dr.Venkataramani said.

Under heterotrophic conditions, mass culture of algae was performed in a bioreactor of 3.1 litre capacity under 'controlled state' to achieve high lipid accumulation.

Micro algal cells harvested from the culture solution were pulverized and bio-lipid oil was extracted with suitable solvents. A standard reaction mixture consisting oil, methanol and concentrate was then heated for a specific period and transferred to a tailor-made funnel where the bio-fuel was separated.

The institute planned to develop an 'industrial model plant' for mass production of bio-fuel using this method.

*Complied

CII meet to push for renewable energy

When oil nears the $140 a barrel mark, it's a good time to push for alternatives. For corporates, renewable energy is no longer about looking fashionably green; it's about economic survival.

The seventh edition of Green Power, the renewable energy conference and exhibition hosted by the Confederation of Indian Industry (CII), which was held at the Chennai Trade Centre from June 11 to 13, 2008 was aimed at exploiting the recent focus on alternatives to oil and attracting investment in the Indian renewables sector.

Talking to journalists, Ramesh Kymal, Chairman of the CII-Godrej Green Business Centre's Renewable Energy Council, said government policies need to be changed to cash in on the opportunities. "There has been investment on the ground, mostly from the private sector—in wind, but also in biomass and small hydel—despite the fact that the policy regime has not been that conducive," he said. Most domestic investment was for captive power producing 5-10 MW. However, to bring in the big international players "waiting to put billions of dollars into Indian renewables," policies had to be made more proactive, said Mr.Kymal, who is also managing director of Vestas India, a subsidiary of the world's biggest player in wind energy.

These large players were focusing on large projects—100 MW and more-and that path might have more of an impact and bring down the cost of renewable energy, he said. According to Mr.Kymal, three major policy decisions would facilitate the entry of such players: feed-in-tariffs for power produced from renewable sources, performance-based incentives in place of the current capital incentives and renewable portfolio standards, mandating States to buy a minimum percentage of their power from renewable sources.

Green energyproponents point out that the socio-economic benefits are also a valuable side effect. "Wind farms create rural

W.D.B. Atmospheric CO_2 can be withdrawn from the atmosphere and injected directly under the seabed led to clean up the atmosphere.

employment-for 60 people per MW in the short term and 20 people in the long term. Apart from strengthening the rural power grid, renewable energy projects usher in holistic rural development and green the wasteland," Mr.Kymal said.

When the carbon trade system is fully exploited, carbon credit revenues will add to the list of benefits. For wind energy projects, this is expected to bring in over 25 paise per KW hour, which will take care of servicing and maintenance costs.

Besides making policy recommendations, Green Power 2008 will explore financing opportunities for renewable energy projects, show case the latest green technologies and offer a platform for networking among key stakeholders.

CII Sources

USE OF WASH' PLASTIC FOR ROAD WORKS GAINS MOMENTUM

S.ANNAMALAI

Efforts to put waste plastics to gainful use have gathered momentum with the Highways Department of Tamil Nadu Government launching a pilot project to test the efficacy of plastic on durability of roads and resistance to deterioration caused by rain. The Department has planned to relay roads using bitumen mixed with waste plastic.

Plastic roads have been laid in many parts of the country but this is the first attempt at waste plastic--bitumen mix.

Shri R.Vasudevan. Head of the Dept. of Chemistry. Thiagarajar Engineering College. Madurai. said that the Bitumen-Plastic mixture would enhance the life of the roads from the present 4 years to 10 years. Plastic serves as a shield against water seepage. Protection of the environment from waste plastic has an enormous advantage. With portable shredders waste plastic accumulated near road sites can be utilized.

Electrochemical devices can meet energy needs

Electrochemical devices play a vital role in meeting energy constraints and ecological needs, said A.Sivathanu Pillai, Chief Controller, Research and Development, Defence Research and Development Organisation.

Inaugurating the 11th Asian Conference on Solid State Ionics (ACSSI), organised by the Bharathiar University (BU)-DRDO Centre for Life Sciences at Coimbatore in June 2008, Pillai said electrochemical devices like solid state rechargeable batteries, fuel cells, sensors, electrochromic display devices and supercapacitors could help meet the demand for alternative energy.

"Electrochemical devices are gaining importance in the energy scenario and are more beneficial than solar, wind and other renewable energy generation systems," Pillai said.

"The continuous depletion of natural energy resources and declining oil fields indicate the need to find an alternative energy source," he said.

Significantly, fuel cells are emerging as an important component of a renewable energy in space programmes and in underwater and have long been used to power spacecraft and submarines, he said.

A fuel cell is an electrochemical energy conversion device that converts hydrogen and oxygen into electricity and heat. It is like a battery that can be recharged, but instead of electricity used for recharging in a battery, a fuel cell uses hydrogen and oxygen.

According to Pillai, more than 200 fuel cell systems are installed all over the world in hospitals, schools, hotels, office buildings, air port terminal and waste water treatment plants.

(The New Indian Express 9.6.2008)

W.D.B. Fertilising the ocean waters for increasing their plankton population which will absorb more CO_2 is a new technology.

Vivekananda Kendra – A Call To The Youth

Sri. A. Balakrishnan
Vice-President
VIVEKANANDA KENDRA, KANYAKUMARI

VIVEKANANDA ROCK MEMORIAL

Swami Vivekananda, with intense love in his heart for motherland undertook wanderings all over India. He came to Kanyakumari and sat on 25th, 26th and 27th December 1892 on the mid-sea rock meditating on India's past, present and future.

It was on this rock that he discovered the mission for glorious India and later shook the world by India's spirituality. On this sanctified place Sri Eknathji Ranade, with the participation of millions of people of India constructed the Vivekananda Rock Memorial, which symbolizes the glorious mission of India as seen by Swami Vivekananda in his meditation. Eknathji was chosen by Sri Guruji Golwalkar to take up this challenging task. He could complete this massive monument with the help of his co-workers from Rashtriya Swayamsevak Sangh, the blessings of Swami Ranganathananda and all other monks of Ramakrishna Math and great sanyasis like Swami Chinmayananda, Swami Chidananda, Swami Chidbhavananda, Paramacharya Sri Chandrashekharendra Saraswati of Kanchi Kamakoti peetham, leaders like Dr Radhakrishnan, Lal Bahadur Shastri, S K Patil, Atalbihari Vajpeyi, Annadurai, M C Chagala, etc and many others from all over the country.

As the Vivekananda Rock Memorial was taking shape, Shri Eknathji Ranade also envisaged a living Memorial for Swami Vivekananda. The result was the conception and formation of the Vivekananda Kendra as a spiritually oriented service mission, which reflected Swami Vivekananda's vision of glorious India in action. The Kendra – a cadre based organization - is an eternal call for those youth who aspire to dedicate their life to serve the nation. Vivekananda Kendra is a call to those youth who want to lead a meaningful, different life in the service of the society.

Vivekananda Kendra aims at national reconstruction through 'Man Making.' The Kendra has evolved a system of moulding Karyakartas – dedicated workers – by screening selected youth and training them as Karyakartas with dedication and skill to undertake the great task of national regeneration. The Karyakartas are of four categories. Jeenavrati Karyakarta - the young men and women who join Kendra for life,

Sevavrati Karyakarta - who join Kendra for a specific period of time, Vanaprasthi Karyakarta - who join Kendra after their retirement and Sthanik Karyakarta – the local people who commit their specific time everyday for the work of Kendra.

Today around 200 Jeevan Vrati, Vanaprasthi and Sewavrati Karyakartas are rendering service through 225 branch centres situated all over India.

YOGA: THE CORE OF VIVEKANANDA KENDRA

Taking Yoga as its core, to attract, contact and involve people belonging to various strata of society in the work of national regeneration Kendra has a unique method of regular activities for children, youth and all others. These are:

1.Yoga Varga – Daily classes for practice of Yoga to lead the Yoga Way of Life
2.Samskar Varga – Weekly classes for children for developing confidence and learning to work in teams
3.Swadhyay Varga – Weekly classes for knowing the purpose of life and for acquiring knowledge about our culture, country and current affairs so as to able to contribute for nation-building.

Number of camps like Yoga Shibir, Spiritual Retreat, Personality Development Shibir, Youth Camps and training camps for the teachers and Karyakartas are also organised at Kanyakumari and other places.

Vivekananda Kendra works to create the awareness for the need of organized work for the regeneration of nation. Such awareness is reflected in its ever-growing activities. To cater to the needs of specific areas in the country and fields of work many service projects as mentioned below are also taken up.

KENDRA'S SERVICE PROJECTS EDUCATION

In the field of education, Kendra is running 58 regular schools affiliated to CBSE, out of these 29 are in Arunachal Pradesh, 16 are in Assam, 1 in Nagaland, 9 in Andaman Islands, 2 in Tamil Nadu and 1 in Karnataka. In all these schools, besides other subjects, English, Hindi, Sanskrit and the local languages are given prime importance. Regular cultural classes are conducted in all the schools in order to give value based education to the children. Total number of students studying in Vivekananda Kendra Vidyalayas as on today is approximately 30,000.

Kendra runs around 220 Balwadis (Nursery schools to take care of the nutrition, health and hygiene along with development of the personality of the tiny-tots.

Kendra is also running 4 Vocational Training Centres for women, out of which 2 are located in Arunachal Pradesh, 1 in Assam and 1 in Karnataka.

In the field of education a unique initiative of Kendra is Anandalaya. Anandalayas are run for the school going rural children to improve their academic as well as also

to help to develop confidence. Gradually Anandalaya become the focal point of positive change for the whole village. Today Kendra is running Anandalayas in Arunachal Pradesh, Assam and Orissa.

WORK IN THE RURAL AREAS FOR GRAM VIKAS

Kendra works in the villages of Assam, Arunachal Pradesh and Orissa, in the rural areas of 5 Southern district of Tamilnadu, in rural areas of Nashik in Maharasthra and rural areas near Bangalore in Karnatak. This Rural development work is for the all round development of men, women and children of these economically backward areas. As part of these Rural Development Programmes, Kendra runs Balwadis, weekly Samskar Vargas, cultural competitions are organized for encouraging the rural talents. Medical centers amd mobile medical vans take care of the health aspects. For the interior areas the youth are trained as Swasthya –Rakshkas who take care of the health and also guide the patients to seek medical help in the initial stages of diseases. The rural youth is guided through one day camps, written examinations etc to face the challenges of life. Deepapooja, Shivapooja, Mahila Jagaran Shibirs, training in tailoring, weaving food preservation are the activities to focus on the rural women, to bring them together to learn about health and hygiene and upbringing of children etc. Besides number of Youth Camps and Personality Development Camps are organized as a regular feature for the rural youths.

NATURAL RESOURCE DEVELOPMENT PROGRAM

Under this project, 4 types of activities are undertaken by Kendra:

1. Water shed management
2. Rural Housing
3. Indigenous Medicines
4. Farming.

Technological Resource Centre set up at Kanyakumari trains the workers, village officers, Panchayat members and NGOs under these four activities. Gramodaya Darshan Park an exhibition on the above four topics is also established in Vivekanandapuram campus.

ARUNJYOTI

Arunjyoti - A programme for the multi-dimensional development of the Arunachali society is a part of the Rural Development Project organized by the Vivekananda Kendra in Arunachal Pradesh. Through this programme Kendra works to organize the Arunachali people and awaken their dormant spirit. Programs are organised in different forums namely - Yuva Manch, Mahila Manch, Swasthya Seva Manch, Sanskritik Manch and Anoupacharik Shiksha Manch.

VK MEDICAL RESEARCH FOUNDATION

Vivekananda Kendra Medical Research Foundation is running a hospital in the Numaligarh Refinery Township complex. This 40 bedded well equipped hospital not only

caters to the needs of the 4000 members of staff and family of the refinery, but also attends to peoples of 13 surrounding villages. Another hospital is being started at Bina in Madhya Pradesh in the township complex of Bharat Oman Refineries Ltd.

VIVEKANANDA KENDRA INTERNATIONAL

In order to take Swami Vivekananda's message abroad and also engage in civilisational and religious dialogues, Kendra has set up Vivekananda Kendra International. This was inaugurated by the then Prime Minister of India Shri. Atal Behari Vajpayee on 23rd May 2003. A befitting suitable building is completed on a plot allotted by the Government of India at Chanakyapuri. Regular monthly lectures with dignitaries on specific subjects are regular feature at present.

VIVEKANANDA KENDRA INSTITUTE OF CULTURE – GUWAHATI, ASSAM

The Vivekananda Kendra Institute of Culture, Guwahati, Assam is established with the purpose of focusing and promoting the cultural continuity of the North Eastern communities with each other and also with rest of India. Also to focus on how development takes through cultural norms VKIC is conducting various seminars, study circles and research works in all the seven states of North East Region. Some of the seminar papers have been published in the form of books and CDs and are available for general public who are interested to know the colorful, cultural life of North East.

KENDRA PUBLICATIONS

As part of the it's various activities Kendra has been bringing out number of books and periodicals based on India's cultural ethos. During the year Kendra has published its second edition of the book "India's Contribution to World Thought and Culture" which was released by the Vice-President Sri Bhairon Singh Shekhawat on 22nd February 2004. The biggest biography of Swami Vivekananda "Comprehensive Biography of Swami Vivekananda" authored by Prof. S. N. Dhar has already entered into third edition. Kendra has brought out books authored by Mananeeya P Parameswaranji, President Vivekananda Kendra – "Marx and Swami Vivekananda", "Heart Beats of Hindu Nation", "Gita and its Social Impact". Many books on various subjects in various languages have been brought out by Kendra.

Vivekananda Kendra's periodicals are

1. Yuva Bharati – English monthly;
2. Vivekananda Kendra Patrika – English thematic half yearly;
3. Kendra Bharati – Hindi monthly;
4. Vivek Vani – Tamil monthly;
5. Vivek Vichar – Marathi monthly;
6. Jagriti – Assamese-English quarterly;
7. Vivek Sudha – Gujarati quarterly.
8. Vishwa Bhanu – Malyalam bimonthly

All these periodicals are meant for the general public and particularly for the youth.

Besides the above mentioned service activities, number of regular activities are

organised in Vivekananda Kendra campus. There are four exhibition maintained by Kendra:

1.Arise ! Awake! – The exhibition depicting the vision, life and message of Swamiji.
2.Wandering Monk – Depicts Parivrajaka phase of Swamiji.
3.Gangotri – An Exhibition highlighting Manaeeya Eknathji's life and the Kendra work.
4.Bharat Gramodaya Darshan Park –The pictorial and live demonstration in ideal management of water, housing, health and Vivekanandapuram Campus also provides accommodation for one thousand people at a time visiting Kanyakumari at a considerably lower tariff. Visitors can stay here in a "Home away from home" atmosphere amidst serene surroundings close to the sea.

CAMPS AT VIVEKANANDAPURAM, KANYAKUMARI

For the people all over the country following residential camps are conducted in the serene atmosphere of Vivekanandapuram

Yoga Shiksha Shibir – for 15 days – In English and Hindi
Spiritual Retreat – for 7 days – In English and Hindi
Acharya Prashikshan Shibir – for 25 days – In English

LIVING WITH A PURPOSE

"They alone live who live for others the rest are more dead than alive" Said Swami Vivekananda. How true! Today when the modern science tells us that existence interrelated, interconnected and interdependent. For living meaningful life, we have to contribute and work for the good of the society.

Vivekananda Kendra invites all contribute their time, energy and money for the actualizing the dream of Swami Vivekananda of vibrant Bharat working for good of humanity.

- Sri. A. Balakrishnan
Vice-President
Vivekananda Kendra, Kanyakumari

Donations to Vivekananda Kendra are entitled to Income Tax Exemption under Section 80-G of Income Tax Act.

The amount can be paid by Cash or Cheque / Money Order / Demand Draft / Demand Draft in favour of Vivekananda Kendra payable at State bank of India, Vivekanandapuram Branch, Vivekanandapuram, Kanyakumari or by directly depositing in our State Bank of India Core Banking Account Number 11305877361(Bank Code No:03780).

For further details, contact:

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