

years ago, I proposed that the plan allocations to its laboratories should be project-specific, apart from the external cash flow, as a measure of the utility of the outputs from the laboratories. The idea was received with thundering silence, as it would have meant accountability on part of the CSIR headquarters also. So much for building accountability.

Robert Sollow, Nobel laureate, has pointed out that the benefits to the US from targetted high science and high technology research and their spin offs, have been immense and materially helped the US economy. Typically, the outputs of such research in academic and research institutions, including those generated through consultancy work, tend to become inputs to the industry, resulting in the development of new spin-off technologies and new products, again resulting in new research programmes. In essence, the loop of knowledge is closed and opened again with new forward-looking research programmes, with substantial benefits to the country at all levels. Except possibly in atomic energy and space, one has to search in-depth to find similar instances of high science and high technology research being conducted with public funds to directly support the technological base of the country. Production based on 'know-how' from abroad would still seem to have a decisive influence on the country's economy, with the academic and research institutions and the industry each going their own way. Their research does not seem to be making any tangible impact on developing a self-generating technology base for the country.

One would get the uneasy feeling that the bulk of research in the academic institutions is more inspired by what is going

on in the developed world, never mind even if it is not of much relevance to respond to our own needs. Self-generating technology bases that will be directly benefited by research, as for example, in fields like superconductivity or nanotechnology, have not been really established. Without such foundations, such research and the money spent on it becomes infructuous and is a wasteful expenditure. Apparently, as mentioned by a former S&T Secretary, something like Rs 50 crores (500 million) was spent on superconductivity research. What benefit did the country receive? Also, one wonders which is more important: a mission to the moon and similar programmes or a more aggressive Anganwadi programme for children and greater investments in education across the board? Without a broad base for education at all levels and self-generating high science-high technology bases, our dream of joining the developed world is a non starter.

One wonders if the S&T departments do any cost-benefit analysis of their investments. It is this that the scientific community and the S&T departments of the government funding scientific research, need to ponder deeply. Whatever happened to the concept of S&T missions? Do the S&T departments believe in such projects, or do they prefer to dole out funds based mainly on committee recommendations and forget about them afterwards? We are not rich enough to afford the luxury of research as an end in itself. When seeking public funds, scientists owe an answer to the public to the question: 'if they succeed in their proposed research programme supported by public funds, who is going to be benefited downstream by their research?' If not,

they are seeking public funds for their research to satisfy their intellectual curiosity, such as it is. The government will then not be obliged or inclined to give higher salaries to the scientific community, except possibly in isolated instances of outstanding performance. If IT professionals in the private sector draw high salaries, it is based on supply and demand and there is inbuilt accountability. They would be unceremoniously fired if they do not deliver the results. In government service, nobody is ever fired except for moral turpitude. In many S&T departments, scientists take their promotions for granted, and not necessarily on vacancy basis only. In any case, they, like all other governments employees, are assured of periodic upward revision of salaries.

It is not the hundreds of research papers inspired by articles in foreign journals which our scientists produce that will benefit the country, but those that lay strong, self-generating S&T foundations that will enable us to join the cadre of the developed world. I believe, it was this objective that prompted Jawaharlal Nehru, Indira Gandhi and Rajeev Gandhi and even the present Indian Prime Minister to give unstinted support to the cause of science in India. We have to live up to their dreams. If not, even President Kalam's 'Vision 2020' will simply remain unrealized.

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Sacred groves for biodiversity conservation in Uttarakhand Himalaya

In India, biodiversity outside the protected area system is rich because of a close relationship between religious, sociocultural beliefs and conservation. These informal protected areas are important from the conservation point of view. These areas include sacred groves, which exhibit rich floral and faunal diversity with some rare and threatened plant species present in them and indicate an ecosystem with various life forms¹.

However, at present, respect and reverence for traditional practices have been diminishing. In this respect a study conducted in Almora district, Uttarakhand concluded that traditional practices have diminished over time². In our country there is increased vulnerability of sacred groves to various forms of degradation and it becomes necessary to protect them from fragmentation³ and changing belief systems⁴.

Uttarakhand (earlier Uttaranchal) State located between 28°43'–31°27'N and 77°34'–81°02'E, also called as 'Dev Bhumi' or the abode of gods is unique in this regard. The landscape in the State is dotted with many holy places of worship. These places are often of small-to-medium size with natural vegetation as a sacred grove of the deity.

There have been several studies on sacred groves in India. However, studies on this

aspect in Uttarakhand are meagre. Sinha and Maikhuri⁵ have described the sacred grove, Hariyali Devi in Chamoli district, and Rawal and Dhar⁶ have described the Chiplakedar sacred grove in Askot Wildlife Sanctuary, Pithoragarh district, Uttarakhand. There are some well-known sacred groves in the State which truly represent the wealth of religion-based conservation traditions. For example, Binsar, Tarkeswar, Tapovan, Nagdev, Goldev, Mayavati, Kot, Nandisain, Paabo, Dewal and Chapdon. Sacred groves in Uttarakhand are many in number (may be more than 1000) with every village or a group of few villages having its own deity, often surrounded by a forest patch considered as sacred.

Sacred groves in Uttarakhand are rich in biodiversity. A preliminary floristic study at the Tarkeshwar sacred grove in Garhwal Himalaya (Pauri Garhwal district) has revealed a rich biodiversity. It is recognized by 85 villages nearby and its inhabitants offer the first part of their new crop to the deity of this sacred grove. A study has revealed that there were 343 species representing 256 genera from 107

families. Among these, 320 species representing 237 genera were angiosperms; 4 species representing 4 genera were gymnosperms; 7 species representing 5 genera were pteridophytes, and 12 species representing 10 genera were bryophytes. The grove is also home to more than 50 species of medicinally useful plants.

The informal traditions of protection provide unique areas of biodiversity conservation in this resource-rich State. The sacred groves have also been found helpful in supporting favourable moisture regimes. This is important because Uttarakhand is an essential part of the Ganges river system. Further, there is an urgent need to document and conserve these traditional practices. We have to recognize these traditionally valued natural systems at various levels and integrate them with legal and policy-level interventions for better management and ultimately the conservation of biodiversity outside the protected areas. Thus the strengthening of institutions of sacred groves can provide mechanisms at grass-roots level for biodiversity conservation.

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