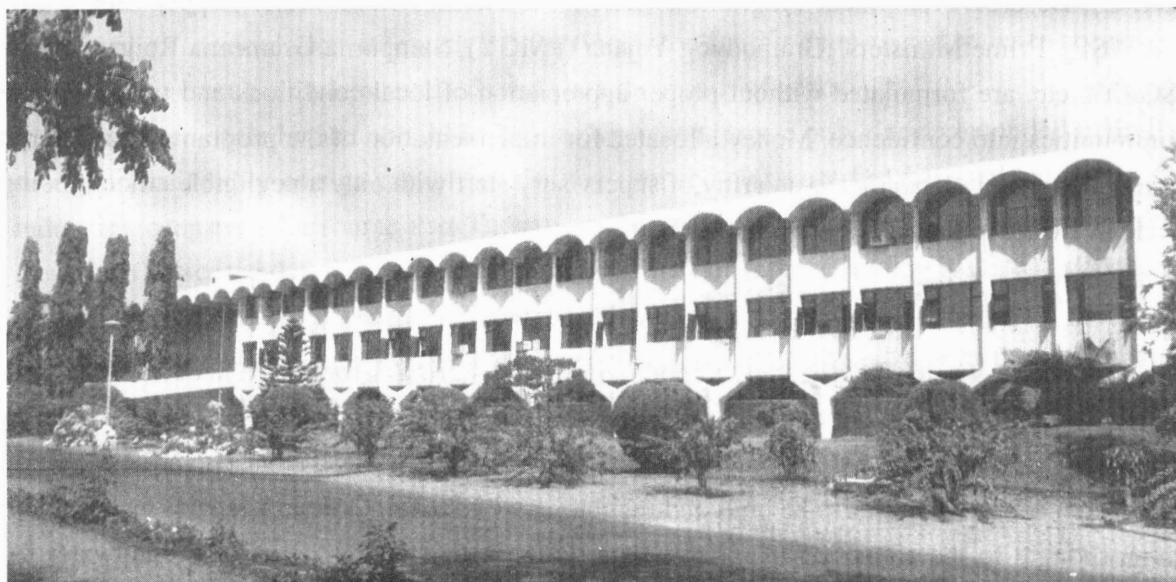


Hyderabad - 2001

“Making Water Everybody's Business”

Thanks to the invitation extended by Dr. Harsh Kumar Gupta, former Director of the National Geophysical Research Institute, the Annual General Meeting of the Society was held at the magnificent campus of the Institute on the 9th and 10th October, 2001. Water Harvesting with special reference to Artificial Recharge were the subjects chosen for discussion at a workshop held to synchronize with the Annual General Meeting.

The topic chosen is one of great importance, as the future well-being of a very large section of our population is dependent on the wise management of water resources. Indiscriminate exploitation by drilling large numbers of boreholes has resulted in overexploitation of a precious resource which ought to have been preserved with great care as an insurance against periods of drought when surface water becomes scarce, rivers go dry and reservoirs remain empty. Such conditions may, and do, recur periodically causing great distress. There is thus an urgent need for Research institutions to undertake intensive studies in estimating groundwater potential and in



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formulating better watershed management, a field in which service personnel of various governmental and non-governmental organizations involved in watershed development have to get trained. It is time that Earth Science Departments in universities equip themselves for offering courses in rainwater harvesting.

Compared to many other countries India is fortunate in receiving copious amount of rainfall, being in fact the second wettest country in the world. In spite of this natural advantage with nature providing enough water every year to satisfy human needs, unsuitable policies and bad practices have led to water scarcity. In order to minimize further deterioration in the position,

action must be taken to impound rainwater where it falls and make it available for local domestic and irrigation needs.

There is now a general awareness of the importance of managing groundwater resources in a better and more efficient way. Research institutes have taken up studies on different aspects of watershed management but these are mostly pure science oriented and have not actively involved beneficiaries at village level, with the result that the outcome of such research ends with the submission of reports which remain filed in offices. It is most important to directly involve workers at village level. Some progress has been made by NRSA in the preparation of hydrogeological maps on a scale of 1:50,000 but these are not likely to be of much use in educating rural folk and village level workers. Base maps on a scale of 1:8000 are available for most parts of the country with which many village level workers are fairly well acquainted. Details relating to the location of wells, their depth and yield, quantity and quality of water pumped, extent of area irrigated and such other details of value could easily be incorporated in these maps.

There is no lack of interest at government level with large sums being sanctioned for rural development and new departments like the Department of Drinking Water Supply coming into existence. But these function from Delhi and programmes like Drought Prone Areas Programme (DTAP), Desert Development Programme (DDP), Accelerated Rural Water Supply Programme (ARWSP), Prime Ministers' Gramodyog Yojana (PMGY), Sampurna Grameena Rojgar Yojana (SGRY), etc. are formulated without proper appreciation of local conditions and taking village communities into confidence. Money allocated for implementation of the programme is frittered away in payment of salaries to an army of supervisory staff with only a negligible amount being made available to the actual work in the field.

Water Harvesting

Collecting water where it falls, impounding it and storing it for future needs are the only sensible ways of conserving our water resources. If this can be achieved, no village will suffer from drought. What is needed is community participation, good technical advice regarding location and design of the structures to be built and regulating withdrawal. Official agencies have seldom given thought to the collection of reliable data on the extent of utilization of groundwater for domestic, industrial and irrigational needs.

So long as water is supplied at highly subsidized rates, users will not be concerned with aspects like conservation and prevention of wastage by resorting to drip irrigation and conveyance of water through pipes and not as at present in open channels with their great wastage of water.

How much water does a man need

Biological minimum requirement of water per person is just 10 litres per day. As against this, affluent communities use over 1000 litres per day for toilets, bathing, washing, and lawn maintenance. Hardly any serious thought is given by either official suppliers or ordinary users to preventing this misuse of potable water brought from long distances and purified at great expense.

Control over the use of groundwater, collecting information on recharge and sustainable yield and monitoring and controlling withdrawal, are all conspicuous by their absence. Regional offices of the Central Ground Water Board (CGWB) have no information on the number of groundwater structures in operation and the quantity of water pumped. Reliable information on how much of the pumped water is used for domestic, agriculture and industrial use is not based on actual survey.

Dynamic and Secular Groundwater

Gallileo said 'I can foretell the way celestial bodies move, but can say nothing of the movement of a small drop of water.' Although we have come a long way since the time of Gallileo, knowledge about the path taken by water, especially in hard rocks, has not advanced much. Groundwater that is being exploited by means of dug wells and drilled wells is confined mainly to the top 50 m of the weathered and fractured zone. Water in this zone is always on the move, getting recharged by rainwater and discharged either through pumping or by flow to the lower sections of the valley and contributing to the base flow of rivers. Water in this zone is continuously in motion from the region of recharge to areas of discharge and it is this water with which we are familiar. There is however, a larger reservoir of water at depth extending perhaps to 500 m below ground level. But our knowledge about this deep-seated water in hard rock areas is very limited, as we really do not know the manner of its accumulation, its extent and the time taken for this deep-seated water to accumulate except that it must have taken hundreds and even thousands of years.

This deep-seated water should be kept as a reserve for use only during extended periods of drought. Availability of rigs capable of drilling deeper holes very fast has enabled people and industries to tap even this source also. Those who can afford the expenditure of drilling and pumping from such increased depths have started drawing from this reserve leading to a steady decline in water table and making shallower borewells go dry.

The occurrence of groundwater at still deeper levels is not known so that methods to recharge deep-seated aquifers in hard rock areas which are even now being exploited on a large scale should likewise receive urgent and increased attention.

Water Literacy, the need of the hour

The following statement by Anil Agarwal (*Down to Earth*, Nov.5, 1997) is of great relevance. It is not just rhetoric but a timely warning to all those who have the welfare of the country and its people at heart.

"Even when the country is facing a water crunch everybody is squandering water. There are no efforts being made to control overexploitation or to control pollution. It is clear that unless a combination of good policies, good economics and good science together with mass public participation in the management of water, millions of Indians are going to die an unknown death earlier because of the shortage of water or a profusion of polluted water. Only the country's civil society can now prevent that from happening. Water literacy is indeed the need of the hour."

The emphasis is very clear. Rainwater harvesting should become a national mass-based movement.

Groundwater Sanctuaries

Challenges thrown up by the changing environment, population pressure, resource utilization with its evil consequences of pollution are grave threats. State and Central governments have not been able to handle these problems of vast magnitude. Water resource management is one such crucial issue calling for leadership of a rare order – the masses have to be suitably educated and actively involved in finding solutions to the numerous problems cropping up everyday. An enormous amount of patience will be required and the scientific community has to take greater interest in solving such societal problems.

Groundwater hydrology should form a subject of today's active ongoing research. This is specially in the case of hard rock areas of south India. Research institutes like the Indian Institute of Science, Bangalore, Regional Research Laboratories, National Geophysical Research Institute and selected universities should set up groundwater sanctuaries where aspects like rainwater harvesting, water impounding, storage and transport and prevention of pollution can be studied in depth and the knowledge gained put into effect in the field.

The water industry at present is entirely in the hands of the government but the subject is so vast that bureaucracy alone will not be able to handle problems effectively. Private agencies, both suppliers and users, have to be involved for more effective operation. In semi-arid regions where water is most needed, heavy losses through evapotranspiration have a serious effect on surface water storage. Creation of large capacity cisterns underground is an alternative which should be seriously considered, primarily for urban areas.

While it is necessary to associate the rural community in various aspects of groundwater development, the lead must be taken by research institutes in the country which should engage themselves in evaluating all aspects of groundwater storage and utilization. There is urgent need for creating groundwater sanctuaries where successful implementation of programmes can be demonstrated and the National Geophysical Research Institute could make a beginning in this direction.

Maps on a scale of 1:10,000 with one metre contour interval have to be prepared and all physical features marked. Existing groundwater structures (wells, bore wells etc) to be located with the depth of each well and depth to water level indicated. Correct record of the quantity (and if possible the quality) of water pumped should be maintained and the water level periodically checked. Landscaping should be attempted by erecting contour bunds with the sole object of impounding rainwater where it falls, the ideal being when not a single drop of water is allowed to escape. Contour bunding, terracing and providing a protective cover of suitable vegetation can prevent rapid run-off and promote infiltration. Fresh water should be pumped into borewells and extent to which such recharging is effective, demonstrated. An automatic recording rain gauge should be installed and a correct record kept of rainfall, its duration and intensity. Extent of water

generated with different intensities of rainfall should be established. Resident quarters within the campus should be equipped with devices capable of collecting rainwater and storing it in basement tanks for non-potable re-use. Nature has provided a vast interconnected reservoir of water below ground. Ways of replenishing this reservoir should be our main concern. Scientific knowledge should be put into practice in demonstration plots.

Self-reliance has to be projected as a worthy way of life as against living on doles from government.

Underground Cisterns for Groundwater Storage

Storage of water in large tanks and reservoirs has a risk of losing as much as 70 to 80% of water stored through evapotranspiration. Construction of large capacity underground cisterns offers a viable alternative primarily in urban areas. The advantage of having such underground cisterns is that they will supply water during the dry season thus reducing the demand on the existing supply infrastructure which is wholly dependent on riparian and surface storage. Construction will not affect the landscape to any degree and additional cisterns can be added gradually as required. These will reduce the practice of drilling large numbers of borewells which, if not restricted, will lead to exhaustion of groundwater storage. Such cisterns are capable of being expanded to any storage capacity. Scientists of all disciplines should take interest and make water everybody's business.

Detailed surveys would become necessary for siting cisterns and determining their capacity. Broad details and suggested configuration of cisterns has been given by Curtis, a mining engineer of repute (*JGSI*, v.51, pp.455-460) and the proposal should be given a fair trial. Population increases indicate that sooner or later recourse to construction of cisterns below ground will have to be undertaken as the surest way of assuring adequate potable water supply.

Role of Non-government Organisations

It is heartening to find many voluntary non-government organisations taking interest in motivating rural folk to solve their problems themselves. We have earlier referred to pioneering efforts of Anna Saheb Hazare in the development of the village, Ralegan Siddi, in Maharashtra. Rajendra Singh of the *Tarun Bharat Sangh* has achieved spectacular results by motivating rural communities in Rajasthan to construct large number of check dams and anecuts across the Aravari river. Many who have visited this area, including no less a person than the President of India, have nothing but praise for the efforts put in by Rajendra Singh and village workers in harvesting rainwater. The bureaucracy and engineers of the Public Works Department have not taken kindly to these efforts of the local people and have issued notices for the demolition of the structures built on the plea that the structures are unsafe, that rainwater belongs to government and its flow should not be arrested. Luckily for Rajendra Singh his services have come to be internationally recognised by the presentation of the Magasaysay Award, the announcement of which has put his critics and the Rajasthan government in an embarrassing position.

As a first step in involving representatives of rural communities, invitations were extended to both Anna Hazare and Rajendra Singh. Only Rajendra Singh responded and came to Hyderabad and addressed the gathering in Hindi, drawing repeated applause from the audience. The full text of his talk in Hindi with English translation will be separately published. The Geological Society recognising the services of Rajendra Singh, specially honoured him by garlanding him and presenting him with a shawl.

Surface water is publicly owned but groundwater is private, belonging to landowner and there is no limit imposed as to its use. Consequently a landowner can pump out any amount of water without regard to the effect on his neighbours as there is no provision in law to limit groundwater extraction.

While erection of simple bunds across smaller *nalas* is accepted as a means of water conservation, the erection of concrete or permanent structures may not be in accordance with existing laws. The legal aspects thus have to be studied and existing provisions have to be modified to facilitate local water conservation by non-official organisations.

Cultural Interlude

The organisers of the workshop had arranged a cultural programme, a dance drama performed by artistes drawn from the staff of the institute. The story selected was quite appropriate being the story of Bhagirath and his ordeal in bringing Ganga from her celestial homeland in the heavens to the earth with concept and coordination by Dr. S. Padma Priya of the NGRI. The drama and her narration of the story in choice Sanskrit verses with perfect accent was a feast for the eyes as well as the ears and was greatly appreciated by all present.

Finale

Thus ended the visit to Hyderabad for the Annual General Meeting of the Society. It is hoped that NGRI, which played host and organised the meeting successfully, will play a leading role in establishing a groundwater sanctuary on the lines suggested which can prove to be a model for the rest of the country to follow.

How to conserve water received as rain? How to prevent water loss and allow it to percolate underground so that it can be tapped when needed? Answers to these questions will depend on a clear understanding of the paths taken by shallow and deep-seated groundwater in heterogeneous earth. It is here that scientists of different disciplines must put their minds together to an understanding of the problem which seemingly looks simple but baffling in its complexity, defying easy solution. A consideration of these problems can no longer be delayed as the future prosperity of the country solely depends on assuring for ourselves adequate supply of water.

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