World's largest rainwater harvesting project in Karnataka

Municipal water supply in most Indian cities is unreliable. Many villages in India do not have potable water supply. Hence Rainwater Harvesting (RWH) has been proposed as an ideal sustainable solution. The Karnataka State Council for Science and Technology (KSCST) has undertaken steps to promote, implement and create awareness on sustainable water harvesting and groundwater recharge concepts. Rainwater harvesting entails the collection of rain where it falls in a scientific and controlled manner for future use. RWH consists of rooftop water harvesting, water from open areas such as paved ways, parks, roads, fields and in lakes and ponds.

Among the three projects initiated by the council, 'Rainwater harvesting in rural Karnataka' funded by Rural Development and Panchayat Raj Department (RDPR), Government of Karnataka is probably the largest rainwater harvesting project in the world. All the schools of Karnataka were carefully studied for the water availability, quality (fluoride contamination) and proximity to the secondary water source. Under this programme 23,683 schools were identified in the first phase to provide drinking water through rooftop rainwater harvesting using a very simple but rugged system.

The highlights of the project are given in Table 1.

The RWH system for schools consists of collection of rooftop rainwater and channelizing through PVC pipes or gutters (PVC pipes slit into two halves) and stored in a fully enclosed surface tank. The rainwater is filtered through a sand bed filter built over the surface tank before storing. A first flush separator is part of the pipeline which allows the first rain to be flushed out with the contaminants on the roof and subsequent, relatively cleaner water is allowed to pass through sand bed filter to be stored in the tank.

In the design of the tank and the sand bed filter (Figure 1), care has been taken to maintain good quality of harvested water. The surface tank is deliberately built without a direct manhole for entry inside and one or more taps have been provided at the bottom. This prevents the sunlight from entering the tank (presence of sunlight and air together supports growth of bacteria, algae, etc. inside the water). The absence of a regular manhole prevents withdrawal of water by dipping vessels and also avoids undesirable elements (lizards, cockroaches, dust, etc.) entering the storage tank. The bottom of the sand bed filter itself is fabricated as a manhole with perforations and can be removed for cleaning the tank when the sand bed is removed for periodic cleaning.

The size of the tank and the pipes for collection from the roof are designed using parameters like local annual rainfall, seasonal variation, number of students in the school, and roof area available (Table 2).

A systematic training and awareness programme was conducted for all the stake holders across the state at various levels (Officers at the planning level in the government to plumbers and masons in the field at a remote village). A series of training programmes (June–August 2005) were conducted at Divisional level and subsequently at District level during the

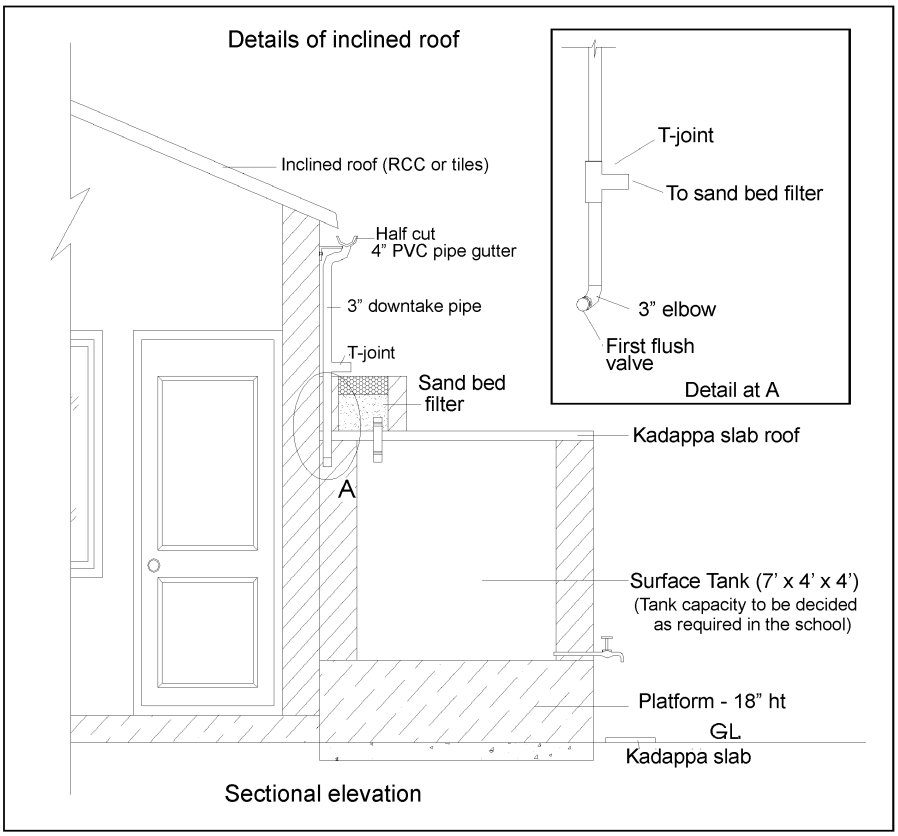

Figure 1. Rainwater harvesting system.

Table 1. Highlights of the rainwater harvesting project

Schools for RWH programme in Karnataka	:	23683
School days per year	:	210
Average student strength in each school	:	118
Average roof area of each school	:	147 m^2
Average RWH storage tank capacity in each school	:	6300 l
Drinking water requirement per student per day	:	1.5 l
Rainwater potential from 23633 schools per year	:	4084 million l
Drinking water requirement per year for 23633 schools	:	880 million l
Total RWH storage tanks capacity	:	149 million l
Minimum number of times the RWH tanks required to be filled to meet the requirement	:	6

Table 2. Parameters used for design of rainwater harvesting system

District	Annual rainfall (mm)			No. of schools for RWH in each district	Avg. annual rainwater potential in l per school*	Min. annual rainwater potential in l per school*	Max. annual rainwater potential in l per school*
	Average	Min.	Max.				
Bagalkote	490	185	952	831	72030	27195	139944
Bangalore Rural	879	475	1156	1602	129213	69825	169932
Bangalore Urban	936	634	1290	729	137592	93198	189630
Belgaum	530	212	3148	847	77910	31164	462756
Bellary	588	401	829	529	86436	58947	121863
Bidar	867	567	1143	550	127449	83349	168021
Bijapur	606	355	910	829	89082	52185	133770
Chamarajanagar	771	411	1066	417	113337	60417	156702
Chikmagalur	1785	1404	2465	1337	262395	206388	362355
Chitradurga	570	344	758	701	83790	50568	111426
Davanagere	607	424	753	754	89229	62328	110691
Dharwad	682	457	848	455	100254	67179	124656
Gadag	597	343	785	353	87759	50421	115395
Gulbarga	717	549	1059	1380	105399	80703	155673
Hassan	956	650	1303	2115	140532	95550	191541
Haveri	728	534	918	812	107016	78498	134946
Karwar	2722	678	5997	1226	400134	99666	881559
Kodagu	2497	1310	4006	131	367059	192570	588882
Kolar	754	494	974	1116	110838	72618	143178
Koppal	602	343	948	429	88494	50421	139356
Mandya	741	487	947	462	108927	71589	139209
Mangalore	3797	2737	5768	518	558159	402339	847896
Mysore	828	583	1110	524	121716	85701	163170
Raichur	640	435	852	790	94080	63945	125244
Shimoga	1717	1254	2374	1188	252399	184338	348978
Tumkur	715	504	928	2768	105105	74088	136416
Udupi	4075	2633	6331	290	599025	387051	930657
Total/average	1163	719	1838	23683	170939	105639	270142

*Average roof area of each school (in sq. m.)	:	147
Number of students per school	:	118
Number of school days in a year	:	210
Drinking water requirement per student per day (l)	:	1.5
Average tank capacity in each school (l)	:	6300
Actual annual requirement of drinking water per school (l)	:	37170

beginning of the programme. In addition to building capacities and training technicians, RWH nodal centres, one at the state level (Mahatma Gandhi Regional Institute of Rural Energy and Development, Bangalore) and 27 at district headquarters (Nirmithi Kendras of respective district) were established. Information, Education and Communication materials are developed by the Council to support the programme and are being distributed across the state. For effective monitoring and incorporating midcourse corrections at the implementation stage, a second series of training programmes were conducted (July–August 2006) in all the 27 districts of Karnataka involving all the stake holders of the programme. Trained engineers, planners, contractors, plumbers and officials are now involved in the installation of RWH systems in the schools

Sand bed filter over a rainwater storage tank

RWH in a village school (Tumkur district)

RWH in a village school (Hassan district)

and monitoring the performance. School Development and Management Committees (SDMCs) in the local village and the teachers of the respective schools are part of the planning, implementation and maintenance team of the RWH system. By June 2006 around 9000 schools had the RWH system in place to receive rainwater. An RWH manual called *Amruthavarshini* (A guide for rainwater harvesting) has been published by KSCST with all the details for effective implementation of the programme.

KSCST has taken RWH projects from Vidhana Soudha to a rural village house. Upon successful implementation of the planned activities, Karnataka State will be the first state in the country to have RWH system installed and working to harvest rainwater for drinking water needs in every other village of Karnataka.

A. R. Shivakumar, Karnataka State Council for Science and Technology, Indian Institute of Science, Bangalore 560 012, India. e-mail: rwhkscst@vsnl.net

MEETING REPORT

Biology today*

The Indian Academy of Sciences (IAS), Bangalore held its seventeenth mid-year meeting at Bangalore during 14–15 July 2006. In addition to promoting and upholding science, the Academy expects its Fellows, individually and collectively, to promote original research and disseminate scientific knowledge to the community through multiple activities such as meetings, seminars, discussions, etc. Further, the Academy recognizes the special relationship of scientific creative activity with the process of education, and upholds the principle of social responsibility for all scientific effort. It further reiterates that the quest for knowledge and truth cannot be reconciled with any dogma (IAS, *Year Book*, 2006, p. 3). The above principles are operationalized through various committees that the Academy has constituted, among which the Science Education Committee is entrusted with the mandate of encouraging and supporting the student and teaching community in its pursuit of science.

In keeping with the above objectives, a one-day symposium was organized for science teachers coinciding with the mid-year meeting. Facilitated by Vidyanand Nanjundiah (Indian Institute of Science, Bangalore) the overall purpose of the initiative was to create larger audience interest and provide a glimpse of current ideas in contemporary biology that could be used in classroom teaching and laboratories. The symposium was structured to consist of lectures of 20–25 min duration each, followed by small group discussions. Teachers were asked to provide candid feedback that could be used constructively for future programmes.

Nanjundiah's lecture on social amoebae focused on the following framework: (a) that natural selection is the overwhelming explanation for the phenomenon of life; (b) however, there are certain exceptions to this phenomenon, of which the altruistic model is the most notable; (c) possible solutions to this curious phenomenon, and (d) an illustration of the solutions using the case of unicellular slime molds. Nanjundiah also stated that despite significant advances, one basic question on how frequent genetic exchange is continues to be perplexing. The focus of the lecture was on the evolutionary explanation for altruism, and the paradox of this witnessed in slime molds. In conclusion, he stated that the level of genetic similarity or heterogeneity does not determine or define altruism or selfishness, and an explanation to this could be possibly found in the socio-biological theories.

*A report on the one-day symposium 'Biology Today' organized by Indian Academy of Sciences, Bangalore on 13 July 2006 at Bangalore.