Participatory Irrigation Management and Mini-watershed development, for well being of the community .

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Abstract -

Water is a very powerful agent in bringing about socio-economic development of the society. Its role has come to prominence, especially in water-scarce basins from developing countries, because of ever increasing competing demands on water, in relation to its finite availability. Integrated Water Resource Development and Management is the pragmatic approach at the planning and implementation stage. But at the operational level, what matters most is the extent of involvement and participation of stakeholders from the beneficiary community, in the operation and management of the infrastructure, to ensure its optimum, sustainable and equitable use. Role of the State Govt so far had been that of a 'Provider and Manager'. It should now change to that of a 'Facilitator and Regulator'. This transformation is possible only if there is radical change in the mindset of the stakeholders and they adopt participatory approach in operation, maintenance and management of irrigation infrastructure. An attempt has been made in the paper to elaborate as to how wellbeing of the people could be achieved through their participatory approach, in the operation and management of scarce water resource, by citing a case study of water-scarce Upper Bhima Basin in the peninsular India.

Salient features of the basin –

Upper Bhima Basin (UBB) comprises 14,700 sqkm catchment area of Ujjani dam (3320 Mcum gross storage) on Bhima river, a major tributary of East-flowing Interstate Krishna river in the peninsular India. The river rises in the North-South running mountain range (Sahyadri), close to West coast of India and receives orographic S-W monsoon precipitation of 6000 to 3000 mm (S to N) along westerly ridge line, but reduces to only about 700 mm within a distance of 70 km towards East. About 60% of catchment in the rain-shadow area towards East, having precipitation varying between 450 to 600 mm, is often subjected to drought conditions. On equity considerations, the Interstate Water Dispute Tribunal Award declared in 1976, permitted the upstream Maharashtra State to

use only 4753 Mcum of water in UBB, against available average runoff of 7373 Mcum at the Ujjani dam site. Each co-basin State has, however, been permitted to make full use of groundwater within their boundary. Present surface water availability of 700 cum/capita/year in the year 2001 is expected to reduce to only about 400 cum by the year 2021,exacerbating the existing acute water scarcity. Present surface water availability of 4200 cum/year/ha of cultivable area would reduce quantitatively and qualitatively in the future, because of rapidly increasing urban and industrial water use and the water pollution associated with it..

Out of the 1096 mm average annual precipitation in the UBB, 943 mm (87%) is received in 4 monsoon months(mid June to mid October). The basin is characterized by high annual evaporation of about 1800 mm (range 2200 to 1500 mm) of which, nearly 50% occurs in 4 summer months (March to June). Due to hard rock geology (parent rock being basalt) and residual soils, groundwater availability, mostly occurring in shallow discontinuous aquifers, is limited, confined and scattered. Seasonal monsoon, together with high percentage of groundwater exploitation (more than 50%) and less than 10% of forest cover, has confined the river flows to only about 5 to 6 months of the year. This situation, coupled with large spatial and temporal variation in the precipitation has made the storage reservoirs, an obligatory human intervention, for meeting varied water demands of the human society.

Surface Water Resource Development in the basin –
Around 1920, five large dams were constructed in the UBB by Tata Hydroelectric Co. to generate power by westward (out of basin) diversion of about 1200 Mcum of water, to meet urban and industrial water needs of Mumbai (Bombay) city. One large dam (56 Mcum) was constructed in UBB around 1870 to provide irrigation to drought prone area and drinking water needs of Pune city. After independence in 1947, 11 large dams (each irrigating more than 10,000 ha) have been constructed so far, to provide irrigation facilities to about 0.36 Mha i.e. 31% of cultivable area of 1.122 Mha in the UBB. In addition to this, Ujjani dam provides irrigation to about 0.18 Mha land on downstream of UBB.

Due to pressure from rainfed cultivators, bypassed by the benefits of large dams, planning priority shifted to small dams around 1970 and about 204 small dams were constructed since then, to provide seasonal irrigation facilities to about 0.10 Mha (9% of CA) of land. Now there is not much scope to take up new surface irrigation schemes (large or small) in the UBB.

Groundwater and Watershed Development –
In the preindependance period, there existed constraint on groundwater (GW) exploitation because of then available dug well technology and use of bullock power to lift water. First boost in GW exploitation was in the form of diesel engine driven centrifugal pumps in the fifties and sixties. But with the advent of energisation, and availability of drilling rigs & submersible pumps, GW exploitation increased by strides in the last 3 decades. With the result, even

though some watersheds have been exploited more than 85% of ultimate potential, overall exploitation in the UBB as of today, is little more than 50%. It has, however, resulted in dispersal of irrigation benefits amongst the rainfed cultivators located in the upper reaches of the watersheds. Ultimate GW potential due to natural recharge and its augmentation by canal irrigation from surface schemes is about 0.16 Mha (14% of CA).
Several water conservation works taken up to provide relief work to the drought affected cultivators during the two-year severe drought of 1970-72, had brought forth this activity to the forefront, as a long term measure for increasing GW recharge on a sustainable basis. It ultimately lead to comprehensive watershed development as a development alternative, comprising construction of appropriate engineering structures designed to conserve soil & water, to provide irrigation to rainfed farms, and providing bio-measures (planting and nurturing of tree saplings and promoting pasture development) to meet firewood needs of people and fodder needs of livestock. Soil conservation works had improved fertility of land, and water conservation works enabled its exploitation to provide protective irrigation to seasonal monsoon crops and winter crops. It resulted as an income generation scheme for rainfed landholders, provided additional employment to landless labourers and gave impetus to supplement income by activities such as rearing of milch animals and poultry development. Watershed development activity has ultimate irrigation potential of about 0.09 Mha (8% CA) on account of the additional GW recharge.

Participatory Irrigation Management
Management of irrigation on private wells is usually found to be very efficient (overall efficiency more than 70%), due to the incentive of attaining maximum productivity and returns, from the limited scarce GW resource. In case of large and small surface irrigation schemes, which are at present maintained, operated and managed by the State Government, the water-use efficiency is only about 30 to 40%. Reasons are attributable to the inevitable rigidity of any large system in making it less responsive to the varying water demands by the crops, resulting untimeliness in water deliveries, poor maintenance of the water distribution network and lack of incentive to the cultivators to save water, because water-rates are charged on irrigated area basis. To improve this situation, State Government had been working out for more than a decade, to evolve modalities for smooth transfer of water management to the beneficiary stakeholders. Some NGOs were associated and involved in this exercise, which lead to formulation of draft Act for the purpose. During the year 2005, State legislative assembly had passed ‘Participatory Irrigation Management Act’ which contemplated transfer of irrigation management of all the State operated surface irrigation schemes to the Water User’s Associations (WUA). Because of the involvement of NGOs in the process of transfer of irrigation management, the transition is expected to be a smooth one.

This paradigm shift in the policy is expected to ensure better operation and maintenance of the system in a more economical manner. It would promote

conjunctive use of surface and groundwater, adoption of micro irrigation systems (drip and sprinkler), more equitable use of water to benefit marginal farmers and achieve more crop and jobs per drop of water. New system could be successful only if there is proactive involvement and participation of the stakeholders. State Government has taken actions to modernize and improve water conveyance and distribution network, so as to ensure timely and dependable water deliveries to the crop. It is now the responsibility of the WUAs to ensure better maintenance of infrastructure, equitable and optimum use of canal water and to increase productivity and returns by common procurement of backward linkages (seeds, insecticides, fertilizers etc) and joint management of forward linkages (transport and marketing of produce). Involvement of surface irrigation beneficiaries in the irrigation management is expected to pay good dividends, because it accounts for major share of irrigated agriculture in the basin.

Management of Watershed Development Works-

By and large, the surface irrigation schemes benefit fertile lands in the command of canal along both banks of the river. Irrigation facilities get extended beyond the canal command to a certain extent towards ridge-line of watersheds, by exploitation of natural GW recharge. But mini-watersheds close to ridges and sub-ridges are still subjected to vagaries of precipitation by subjecting the rainfed cultivators to practice subsistence agriculture Watershed development works are important on account of social and equity considerations because they provide opportunities for upliftment of this disadvantaged section of the society, by providing them protective irrigation facilities. The additional GW recharge because of water conservation works is more precious and valuable to them because it ensures not only their survival but also their wellbeing.

Involvement and participation of beneficiaries at the planning, implementation and operation stage, is the essence of its success and is vital for its sustainable functioning, as would be seen from the points listed below.

- At the planning stage, stakeholders shall ensure that proposed structural measures for conservation of water and soil are compatible to local site conditions, available construction materials and skills of local artisans.
- During implementation, they shall exercise good control on quality of structures, so that they would deliver expected sustainable service during their lifetime.
- Usufructuous benefits such as drinking water for people and cattle, fodder for livestock, firewood for cooking, and improvement in soil fertility, could be shared equitably by all stakeholders. But supplemental GW recharge is available mostly in the middle and lower reaches of the mini-watershed and has to be shared in a fairly equitable manner, by providing protective irrigation facilities only for seasonal crops to as many cultivators as is possible. If irrigation benefits are usurped by few influential cultivators to grow water intensive cash crops, the scheme is destined to fail.

- If practice of cutting grass and stall-feeding of cattle is not followed, productivity of common pastures would reduce drastically. If tree saplings on common property are protected and nurtured (no grazing of cattle and no use of axe for tree cutting) for 7-8 years at least, annual incremental biomass from the trees, duly supplemented by agricultural waste could sustainably meet firewood demand for cooking. It would then stop degradation of terrestrial ecosystems.
- Silt accumulated in soil conversion works should be periodically removed and spread on fields to improve their fertility and to enhance GW recharge from the structures.
- Inputs requited for irrigated agriculture and marketing of surplus produce could be conveniently organized as a common activity by the WUAs, to the benefit of all stakeholders.
- WUAs should take actions to pursue the State Government to provide common infrastructure facilities for milk collection and transport, poultry development etc. to supplement farmer's income and to improve his sustenance during drought years.

Role of urban population and Industries -

Water needs for domestic and industrial demands for Pune city (second largest city in the State) and adjoining Pimpri-Chinchwad cities(having total population of 4.7 Millions) have increased very rapidly,(demand increased 18 times during 1961 to 2001) and by the year 2021, it is expected to increase to 972 Mcum, consuming all water stored in the 5 large dams upstream of the city. Release of untreated(small quantity is only treated) effluent generated as a result of this use, has not only reduced quantum of water available for irrigation to drought prone area, but has also degraded the riverine and man-made ecosystems (reservoirs) qualitatively. It has given rise to urban-rural conflict due to reduction in water available for irrigation to drought prone area.

Unfortunately, there is total lack of awareness amongst urban population about the effects of pollution, which at present is affecting the population located on downstream. Because of the excessive urban & industrial pollution load released in the upstream reaches in the neighborhood of Pune city, the river stretch from Pune city to Ujjani reservoir, a distance of 105 km, is heavily polluted with adverse impacts on health profile of the society along riverbanks and along the fringes of reservoirs. Treatment of the effluent has to be the first priority in the coming decade. Reuse of the effluent for agricultural purposes has increasing relevance in the water resource management and has to play a critical role in the basin. Average per capita water consumption in the Pune city is highest in the country (about 300 lit/capita/day). People are not aware of this excessive use of treated water for domestic purposes and no efforts are taken by them to avoid wasteful use of water..

Upper Bhima Water Partnership- Under the aegis of GWP-SASTAC (Global Water Partnership- South Asia Technical Advisory Committee) several Non-

Government, Semi Government and Government organizations had formed Upper Bhima Water Partnership (UBWP) in the year 2001, to carry out comprehensive study of all water related issues in the basin and to indicate possible measures and actions to mitigate them. 'Vision' report presented in the first South Asia Water Forum at Kathmandu, Nepal highlighted actions necessary, 'to establish a pollution free productive regime for the continued sustainable and equitable socio-economic development of the Upper Bhima Basin Area, through Integrated Water Resources Development and Management'.

Actions taken by UBWP – To increase awareness amongst urban population about measures to economize on consumption of water for domestic use, a competition was held for school children from the formative age group. They approached more than 1000 families who were representative of cross section of population from Pune city and apprised them of simple water saving measures which they could easily practice and appreciably reduce daily water consumption.

Poor quality of drinking water has been a chronic problem in rural area, which has been affecting health of people. Hence similar activity for students from rural area was organized to promote adoption of SODIS i.e. Solar disinfection of drinking water, by exposure of water filled plastic bottles for 6-8 hours to sunlight.

To promote involvement of stakeholders in the watershed development works, a competition of best managed village was held. A book in local language titled as 'watershed development - technique and technology' was written by the author and about 7000 copies were sold on 'no profit no loss' basis, at a cost of about one US dollar per copy. A Poster on watershed development works was got printed and copies were distributed in villages and organizations to increase awareness of this important activity amongst rural population.

The author had participated in the World Water Week Festival at Stockholm, Sweden in August 2004 and presented .a poster on 'Watershed Development approach – A sustainable development alternative for rainfed cultivators'.

The author had participated in the 8th International River Festival at Brisbane, Australia, in September 2005 and presented a poster viz. Urban-rural conflict in sharing of scarce water resources and possible solutions for water-scarce Upper Bhima Basin in peninsular India.

Conclusion – State Governments had so far played the role of a 'Provider and Manager' in water resources development and management, more so in the developing countries. For more efficient and sustainable operation of the infrastructure, stakeholders have now to play a proactive role in the form of participatory irrigation management and coordinated operation of comprehensive watershed development works; and the Government should now play the role of a 'Facilitator and regulator'. Changing mindset of the stakeholders(having average family holding size of only 1 to 2 hectares), is expected to be a slow process. It calls for enlightenment of the stakeholders, implementers, administrators and policy makers as well, by making them 'Water-Literate'. Government machinery is slow to act and correct implementation of well-meant

policies and acts had never been its forte. It is through the social pressure brought about by the water-literate stakeholders, there is hope that Government machinery can overcome the aberrations in implementation of policies, created because of vested interests, political expediencies and lack of political will. It is hence envisaged that full involvement and participation of the stakeholders in the efficient operation and management of the water resource development infrastructure facilities, would enable achieving the Vision goals earlier in the near future.